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ABSTRACT

This final report describes the development and test of a computer readability editing system for use in improving the ease of comprehending Navy technical manuals and training materials. The prototype editing system has features to (1) flag uncommon and misspelled words and long sentences, (2) suggest simple replacements for difficult words, and (3) calculate the readability grade level. Each feature is consistent with Navy specifications and each has been thoroughly tested to verify that it provides useful feedback to editors and authors. The report recommends operational implementation of the system, conduct of a cost benefit analysis, and the addition of an online editing capability. Appendices include references, various system word lists, test passages to evaluate the system, and instructions on how to use the system. (Author/RAA)

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TAEG Report No. 83

DEVELOPMENT AND TEST OF A COMPUTER READABILITY EDITING SYSTEM (CRES)

J. Peter Kincaid
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Training Analysis and Evaluation Group

March 1980

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This report describes the development and test of a computer readability editing system to improve the ease of comprehending Navy technical manuals and training materials. The prototype editing system has features to (1) flag uncommon and misspelled words and long sentences, (2) suggest simple replacements for difficult words, and (3) calculate the readability grade level. Each feature is consistent with Navy specifications, and each has been thoroughly tested to verify that it provides useful feedback to editors and authors.

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SECTION I

INTRODUCTION

BACKGROUND

The Navy relies heavily on technical documents for training and maintenance functions. According to figures tabulated by the Naval Technical Information Presentation Program[1] (NTIPP), the Navy's investment in technical manuals is tremendous:

- There are approximately 25 million pages of technical publications in the Navy's current inventory with a value of $5 billion.

- About 3 million pages of technical publications are issued or reissued annually.

- A typical U.S. Navy ship carries 1,300 technical manuals totaling 325,000 pages.

Unfortunately, these expensive Navy technical materials are often too difficult for enlisted personnel to use. Two major aspects of the problem are articulated in recent studies by the General Accounting Office (GAO):

- A growing number of Navy enlisted personnel have reading deficiencies (GAO, 1977).

- Technical manuals for the U.S. military services are difficult to read and use. In addition, it will cost an estimated $65 million for the Navy to rewrite them to a lower reading level to enable the recruits of the 1980s to understand them (GAO, 1979).

An additional aspect of the problem with technical manuals was identified in a recent survey conducted for NTIPP (Hughes-Fullerton, 1978). This survey found that technical manuals are used extensively in formal and informal training, but they usually have to be supplemented heavily to be usable as training documents.

The three military services have produced further evidence that technical manuals are written at a level too difficult for use by enlisted personnel. Recent summary publications include: Caylor, Sticht, Fox and Ford, 1973 (Army); Duffy, 1976 (Navy); and Kniffin, Stevenson, Klare, Entin, Slaughter and Hooke, 1979 (Air Force).

The Chief of Naval Education and Training (CNET), in recognition of these problems, tasked the Training Analysis and Evaluation Group (TAEG) to undertake the development of the Computer Readability Editing System (CRES)[2] and to develop remedial aids for enlisted personnel with deficient academic skills.[3] These tasks are complementary in that both are designed to close the literacy gap.

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[1] Personal communication, S. C. Rainey, Technical Manager, NTIPP.

TAEG Report No. 79 (Kincaid and Curry, 1979) describes the development and test of a remedial reading workbook currently in use for Navy recruits. A companion remedial numerical skills workbook is currently under development and will be described in a future TAEG report.

PURPOSE OF THE REPORT

This report describes the development of a CRES to assist in the improvement of the readability of Navy technical manuals and training materials.

ORGANIZATION OF THE REPORT

In addition to this introduction, the report contains three sections and seven appendices. Section II provides an overview of the CRES and describes each feature of the system, the rationale for its inclusion in the system, and its development. Section III summarizes the results of an evaluation of the effectiveness of the system in helping an editor or writer. Section IV contains conclusions and recommendations. Appendices A through E contain complete listings of the word lists developed for use with the system. Appendix F contains the test passages used to evaluate the system. Appendix G shows an example of the use of the system.

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[2] CNET ltr of 29 June 1978.

[3] CNET ltr of 20 December 1978.

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SECTION II

DEVELOPMENT OF THE COMPUTER READABILITY EDITING SYSTEM (CRES)

This section contains an overview of the CRES and its operation. It also contains a description of each feature of the system, its development, and the rationale for including it.

OVERVIEW

Figure 1 shows the major components of the CRES. These include the computer equipment and the data files which contain the various features of the system. The CRES was designed to contain features that:

- provide useful feedback for authors and editors to simplify training and technical manual materials
- are consistent with existing DOD and Navy directives governing the preparation of simplified manuals
- can reduce the cost of preparing and revising technical manuals and training materials.

Each of these features is discussed in detail in subsequent paragraphs.

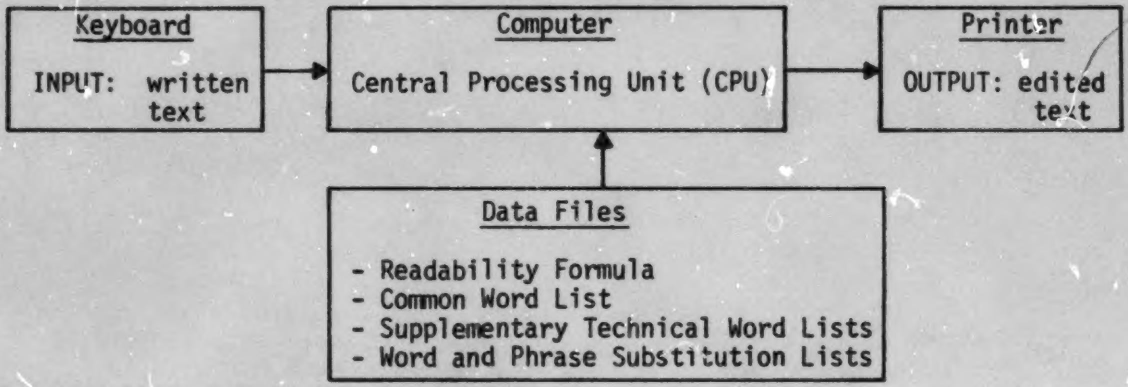

Figure 1. Elements of the Computer Readability Editing System

The basic purpose of CRES is to accept written narrative material, evaluate that material for readability, and suggest editorial changes in content (words) based on stored lists of words which have been developed to reduce the difficulty of reading material.

SYSTEM HARDWARE

The hardware components of CRES include an input device (keyboard), the central processing unit (CPU), mass storage devices (disks and tapes), and the output device (the printer). The specific hardware used in TAEGs system includes:

- WANG 2216A or 2236D CRT for displaying and editing
- WANG 2200 VP or MVP CPU
- Flexible disk drive
- WANG 2200 compatible printer
- 15 megabyte platter and compatible 90 megabyte disk drive.

Current cost of this equipment is about $40,000.

SOFTWARE FEATURES OF THE SYSTEM

READABILITY FORMULA. A readability formula provides a measure of the reading difficulty of a sample of text. The Flesch-Kincaid Readability Formula (Kincaid, Fishburne, Rogers, and Chissom, 1975) is used in the system because it is the DOD standard (MIL-M-38784A, Amendment 5, 24 July 1978). This formula provides a reading grade level of the sample text which refers to the "average" reading ability of those who should be able to understand the text. It is a recalculation of the Flesch Reading Ease Formula (Flesch, 1948).

The formula was developed by testing Navy enlisted personnel on their understanding of passages from rate training manuals. The Flesch-Kincaid Formula is:

$$\text{Grade Level} = .39\ (\text{Avg. No. Words/Sentences}) + 11.8\ (\text{Avg. No. Syllables/Word}) - 15.59$$

The computer program that calculates this formula is adapted from the General Motors STAR program which was originally designed to calculate the Flesch Reading Ease Formula. The program counts the number of syllables, words, and sentences in a passage of text, then computes the above formula. The grade level thus produced by the editing system serves as a general guide to the writer concerning the appropriateness of the material for the intended readers. If the grade level is too high, the text should be simplified.

Readability formulas provide only a general indication of the overall level of difficulty. The other components of the CRES provide more specific feedback to writers about particular words and sentences.

COMMON WORD LIST. The Common Word List was developed to identify uncommon words. If a word is not on the list, it is presumed to be uncommon. If a word is flagged as uncommon, a decision must be made whether to retain it, replace it with a simpler word, or define it. This decision is subjective and must be made by the author or editor, not by the computer. Simplifying the words used in training and technical manual texts will result in instructional material that is more easily read and understood by the trainee and the technician. The Common Word List is a merged list made up of five published word lists plus one list specifically prepared to include Navy-specific words. The five published lists come from both military and nonmilitary sources. Table 1 contains a short description of each list and gives its source.

TABLE 1. WORD LISTS USED IN THE COMMON WORD LIST

Military Lists

- Basic Navy Word List: 1,960 words that appeared 10 or more times in a 240,000 word sample taken from Navy recruit training texts.
- American Institute for Research List: 1,570 words derived from frequency analysis taken from a 238,480 word sample of Army, Navy, and Air Force training courses.
- Bureau of Naval Personnel Verb List: 270 verbs derived from recommendations of verbs to be used in occupational standards by the Occupational Standards Committees.
- Army Familiar Word List: 2,170 words taken from the 2,980 words on the Dale list and modified by deleting uncommon Army words and adding common Army words to the original Dale list.

Nonmilitary Lists

- National Cash Register Fundamental (NCR) English Word List: 1,220 words derived by a frequency analysis of a sample of 97,000 words taken from NCR training materials. The published list is the result of two modifications by an NCR panel of users.
- Basic English Word List: 850 words judged to be the essential words needed for communication developed by English scholar O. G. Ogden and associates over a 10 year period during the 1930s.

The Basic Navy Word List described in table 1 was derived from a computer frequency analysis of the two major documents used in the Navy's recruit training curriculum--Basic Military Requirements (1973) and the 20th edition of The Bluejackets' Manual (1978). The words from these two training manuals were entered into the computer. Only those pages of Basic Military Requirements that the recruits actually read in recruit training were keyed into the computer. All the text of The Bluejackets' Manual was available on machine-readable computer magnetic tape and was used for the frequency analysis. From these two documents almost 240,000 words were analyzed to obtain word frequency counts. Only those words which had a frequency of 10 or more were included in the Basic Navy Word Lists; acronyms, numbers, and punctuation marks were not included. Also, the list was edited to include only "root words," that is, those words in the present tense and singular. The Basic Navy Word List is made up of two kinds of words: (1) common familiar words that a high school graduate should know and (2) terms that are unique to the Navy or general military environment.

An initial analysis showed that the Basic Navy Word List did not contain a number of obvious common words, such as "none" and "if." Therefore five published word lists, judged to contain a preponderance of words commonly used in Navy training and job reading materials, were added to the Basic Navy Word List. In addition, the Dale-Chall list (Dale and Chall, 1948) and the Harris-Jacobson list (Harris and Jacobson, 1972) were considered but not included because they were deemed inappropriate for Navy enlisted personnel.

Each of the lists described in table 1 was entered into computer memory then merged alphabetically resulting in a list of about 3,200 different root words. Nearly all of these were retained in the final Common Word List. A few of the words from the NCR list were dropped because they were specific to that company. Appendix A contains the Common Word List, including the Basic Navy Word List; appendix B contains the Basic Navy Word List alone.

In the Common Word List described above, each word has only one inflected form. These "root words," however, can have different inflected forms when they actually appear in text. The root words of the Common Word List were expanded by attaching various standard endings to each word. (See table 2 for the inflected endings attached to each word.) These inflected forms of the root words are based on rules developed by Harris and Jacobson (1975).

TABLE 2. RULES FOR INFLECTED ENDINGS

Root word plus	-s (plural), -y, -ly, -ily -s, es, 's (possessive) -d, -ed, -er, -est (comparative)
All words with double consonant before	-ing, -er (comparative), -est
All words dropping final -e before	-ed, -ing, -er (comparative), -est
All words changing y to i before adding	-ed, -es, -er (comparative), -est

An expanded list containing all possible endings for each root word resulted from processing the words by computer with a program designed to apply the rules of table 2. In addition, the expanded list had to be modified to add irregular verbs and a few other word forms. The algorithm of table 2 produced some "nonsense" words (e.g., the word "ship" is expanded by the algorithm to include words like "shippest"). The final word list containing the inflected endings is called the "expanded Common Word List." This was the form of the Common Word List actually used in the CRES. The expanded Common Word List is currently being edited to remove nonwords. This will reduce the total number of words in the list from about 37,000 words to about 14,000 words and thus allow faster operation of the system.

SUPPLEMENTARY TECHNICAL WORD LISTS. Although the Common Word List should contain most words in general Navy reading material, it does not contain many technical terms used in specialized reading material. Therefore, it was necessary to construct supplemental lists for use with certain kinds of specialized material.

The technical supplementary lists contain technical terms which are frequently used and commonly known by technical specialists but not by a nonspecialist. For example, an electronics technician would certainly know the meaning of "capacitance" whereas a nonspecialist might not. These supplemental lists are a necessary part of the CRES for the editing of text dealing with technical specialties, otherwise the system would flag words like "capacitance" appearing in electronics training materials. Word list categories were chosen to coincide with clusters of ratings within the Navy that use a common core of technical terms. Three Navy occupational groupings were suggested by the Job Oriented Basic Skills (JOBS) Program. The JOBS program is designed to improve the basic skills of sailors with aptitude scores too low to allow them to enter "A" schools. Categories for the lists include: propulsion engineering, electronics, and administrative-clerical. Table 3 shows the three occupational categories and sample ratings within each category.

TABLE 3. OCCUPATIONAL GROUPINGS SUGGESTED BY JOB ORIENTED BASIC SKILLS (JOBS)

Three Occupational Categories and Ratings Within Each Category

Propulsion Engineering	Electronics	Administrative-Clerical
Boiler Technician	Gunner's Mate	Yeoman
Engineman	Electronics Technician	Personnelman
Machinist's Mate		Storekeeper

The words which were combined into the final three supplementary lists were taken from three sources: (1) chapters from the Naval Sea Systems Command Manual NAVSEA S9086, (2) glossaries taken from relevant rate training manuals and Navy training courses, and (3) technical word lists taken from manuals published by the Defense Language Institute. After merging words from the three sources for each of the specialty areas, the combined lists were each judged for appropriateness by subject matter experts. References for each of the sources, and the lists to which each contributed, are contained in appendix C along with the lists.

The first source of supplementary words, NAVSEA manual, was chosen because it is a reference source carried aboard many Navy ships and because it contains text generally representative of Navy technical manuals and training materials. A computer frequency analysis was used to identify the most frequently occurring technical words. Words on the Common Word List were excluded from this frequency count. Chapters dealing with lighting and basic electronics contributed to the electronics list. Chapters dealing with damage control and disposal of hazardous materials contributed to the propulsion engineering list. Chapters dealing with administering funds and records and reports contributed to the administrative-clerical list. The text of the six chapters was available on magnetic tape. Words that appeared at least twice were included on the initial list that was subjected to editing by appropriate subject matter experts.

The second source of technical words for the supplementary lists were appropriate rate training manual glossaries. Five rate training manual glossaries were used to obtain technical words for the electronics list, two were used to obtain words for the propulsion engineering list, and one was used to obtain words for the administrative-clerical list. In addition to the rate training manuals cited at the end of appendix C, two glossaries from Navy training courses contributed to the lists: (1) a handout used in Basic Electronics and Electricity "A" School at Orlando, Flordia (electronics list) and (2) a handout used in the propulsions strand of JOBS taught at San Diego, California (propulsion engineering list).

The third source of words for the supplementary technical word lists were glossaries contained in manuals published by the Defense Language Institute (DLI). The subject matter for the DLI training courses corresponds to the three specialty lists. The titles of the DLI manuals and the specialty list to which each contributed are Basic Electronics (electronics list), Maintenance and Mechanics (propulsion engineering list), and Clerical and Administrative, (clerical-administrative list).

Words from each of the sources were combined to form a single list for each of the specialties. Subject matter experts (noncommissioned officers and petty officers with appropriate ratings) identified the most important terms in their specialty in a two part process. Initially, a single expert checked those words which "A" School graduates (as listed in table 3) should know. Then a new computer printout was prepared containing only the terms checked. Three subject matter experts then independently rated words on the reduced list using the same criterion. Words in the final supplementary lists, as contained in appendix C, are those that at least two of three subject matter experts identified as necessary to perform the particular specialty.

WORD SUBSTITUTION LISTS. A word substitution dictionary is a feature of the system because a good way to improve the readability of a manual is to replace awkward words with simpler or more specific words. A word substitution list can help an editor to do this. The words to be replaced are unnecessarily long, unfamiliar, or perhaps imprecise. The recommended substitute (or substitutes) is shorter, more familiar, or more precise. Once undesirable words are identified and substitutes offered, the writer makes a decision as to whether or not to replace the word with one of its proposed substitutes. A word substitution list and the Common Word List can help a writer with word control.

Two existing word substitution lists were adapted for use in the system. They were the Army Word Substitution List (Cir 310-9, 15 December 1978, Headquarters Department of the Army) and the Navy Verb List (DOD-STD-1685(SH)). Each list consisted of words needing replacement with at least one, sometimes two or more, recommended substitutes. A few of the substitutes were phrases, but most were words. Only two substitutes were retained. The Army Word Substitution List (excluding phrases, which were put on a special phrase list) contained 183 words paired with recommended substitutes. The Navy Verb List contained 108 verbs with recommended substitutes. The Navy Verb List also included a number of verbs designated "Use more specific verb" and a number of verbs which were "recommended verbs"; these were not included in the word-substitution list adopted for TAEGs system from the Navy Verb List. Some overlap was noted among the Army List, the Navy Verb List, and the TAEG Common Word List. The purpose of this approach was to test the lists as separate units.

Both of the above lists had been compiled using expert judgment. The major criterion for the inclusion of words in the Army List was that substitutes should be short and often one syllable; thus, its recommended substitutes are the common words of the language. Selection of words for the Navy Verb List followed several guidelines contained in DOD-STD-1685(SH). "The simplest, most familiar, and most concrete words---shall be used. Short words, words typically learned early in life,---shall be preferred." "Concrete and specific language shall be used---", and "nonspecific verbs shall be avoided in favor of verbs designating specific user actions."

To summarize, two strategies were used in compiling the substitution lists: the use of simple, common words and the use of specific verbs. Example 1, table 4, shows substitutes that are common verbs; example 2, table 4, shows substitutes that are more specific verbs than the ones replaced.

TABLE 4. EXAMPLES OF DIFFERENT SUBSTITUTION STRATEGIES

Example No. and Type of Strategy	Word	Substitute	Form
1. Substitutes that are more common verbs than the ones replaced (From the Army List)	affix	put	verb
	constitutes	is	verb
2. Substitutes that are more specific verbs than the ones replaced (From the Navy Verb List)	mate	attach	verb
	stop	shut-down	verb

In the original substitution lists each word appeared with its recommended substitute(s) in only one form. Since a word can appear in a variety of inflected forms in text, each word and its substitute(s) was transformed into several inflected forms for use in computer editing, thus expanding the word substitution lists. Only transformations that maintained like meanings for words and their substitutes were used in the expanded lists.

Table 5 contains a listing and examples of the master guidelines by which transformations of words were achieved. The only transformations used on the Navy Verb List were those which produced verb forms, thus retaining the original nature of the list. The three verb transformations plus the original verb form are shown in example 2 of table 5. Irregular verbs departed from these rules somewhat, usually requiring a past participle form in addition to the four forms shown in example 2, table 5. An irregular verb and its transformations are shown in example 3 of table 5.

All inflected forms of a word were considered to be variations on one root word if they were all of the same part of speech. The root word would be the form originally appearing in the list, and in the case of nouns or verbs would usually be the singular noun form or the plain verb form (see examples 2, 3, and 4 of table 5). When evaluation was of the words themselves, root words were the unit of evaluation.

The expanded Army List contained 725 different word forms, and the expanded Navy Verb List contained 431 different word forms.[4] The number of root words was 261 for the Army List and 108 for the Navy Verb List. The expanded Army List is contained in appendix D and the expanded Navy Verb List in appendix E.

EDITING PROCESS

The operation of the system is illustrated in figure 2. The first step is to select those features of the system which are to be included. Then text is entered either by keying or through the use of magnetic tapes or some other machine-readable medium. After text is entered, each word, except proper names, is compared against the words in a series of lists: the Common Word List, any of several supplemental word lists, and the word and phrase substitution list. If a word is not found on the Common Word List and any supplemental word list which might be in use, it is flagged. If a word or phrase contained in the substitution list is encountered, it is flagged and one or two generally better substitutes are provided.

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[4] A few of the inflected forms of the Army List had been excluded prior to this count. These exclusions were due to the word and its substitute being inappropriately matched for this particular form. The total number of such exclusions was 22.

TABLE 5. EXAMPLES OF WORD TRANSFORMATION

Example No. and Type of Transformation	Original Word			Transformed Word		
	Word	Substitute	Form	Word	Substitute	Form
1. A transformation that leads to nonequivalent meanings	employ	use	verb	employer	user	noun
2. Three transformations for regular verbs	activate	start	verb, plain	activated activating activates	started starting starts	verb, past verb, present participle verb, singular
3. Four transformations for irregular verbs	elect	choose	verb, plain	elected elected electing elects	chose chosen choosing chooses	verb, past verb, past participle verb, present participle verb, singular
4. Three transformations for nouns	location	place	noun, singular	locations location's locations'	places place's places'	noun, plural noun, possessive noun, plural possessive

NOTE: Additional grammatical variations are possible but these are by far the most common.

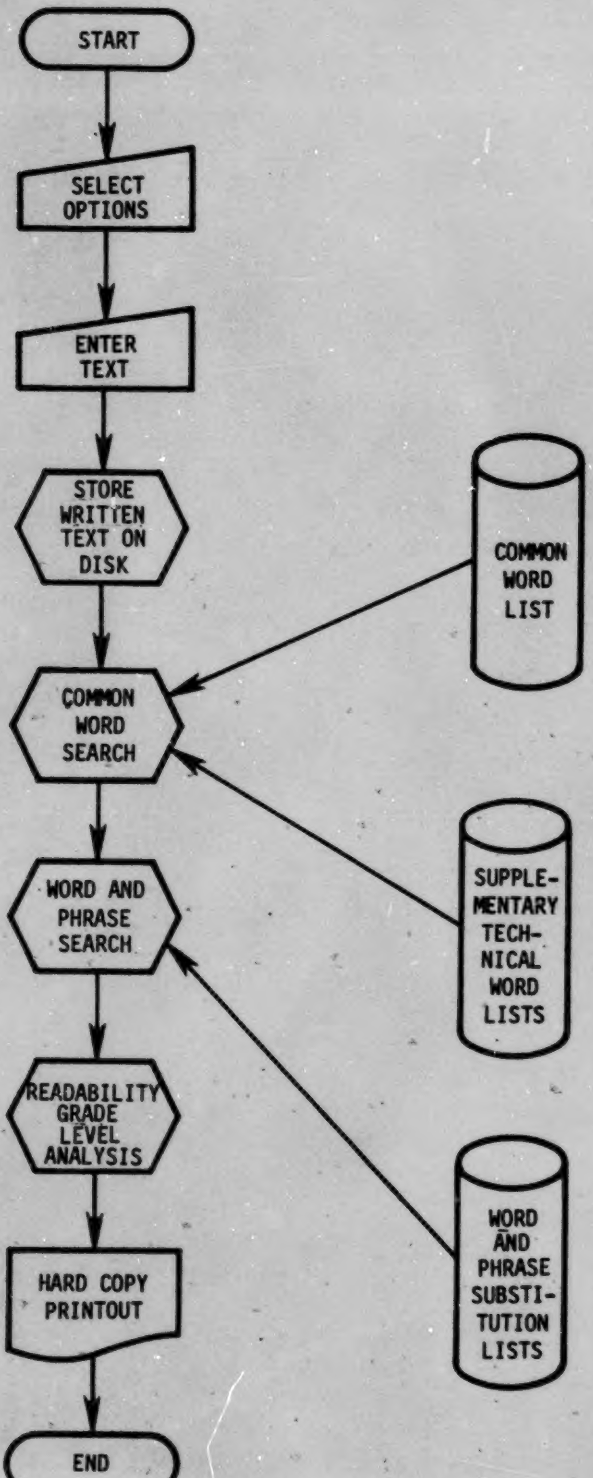

START
SELECT OPTIONS
ENTER TEXT
STORE WRITTEN TEXT ON DISK
COMMON WORD SEARCH
WORD AND PHRASE SEARCH
READABILITY GRADE LEVEL ANALYSIS
HARD COPY PRINTOUT
END
COMMON WORD LIST
SUPPLEMENTARY TECHNICAL WORD LISTS
WORD AND PHRASE SUBSTITUTION LISTS

Figure 2. Flowchart Showing Phases of Editing by the Computer Readability Editing System

The printout in figure 3 contains this text along with computer-generated editing notes. Changes and corrections are done by the author or editor using his judgment as well as the computer-generated suggestions.

The printout illustrates features of the editing system which:

- flag uncommon words--those not on the Common Word List or supplementary technical word lists being used
- flag long sentences--those over 22 words
- suggest replacements for awkward words and phrases
- provide the grade level of difficulty according to the DOD readability standard--the Flesch-Kincaid Formula.

In addition, the system flags misspelled words if they are not on the Common Word List.

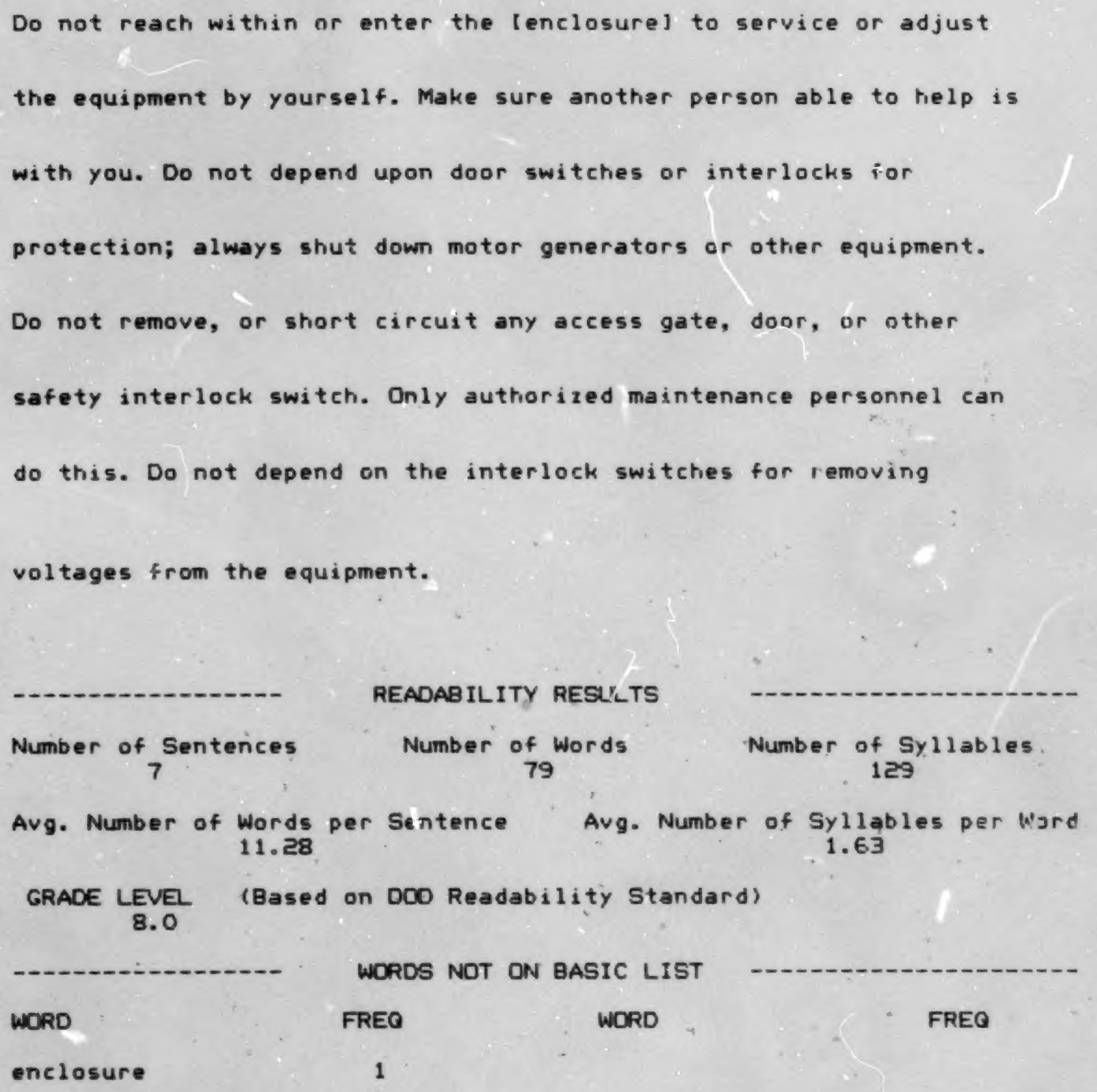
The printout in figure 4 shows the revised text. All changes made were suggested by the CRES. Note that the reading grade level of the revised text is 8.0, a considerable improvement over the 17.1 grade level of the original text.

An additional, more detailed example of the evaluated and revised text using the CRES is shown in appendix G.

Do not ~~Under no circumstances should any person~~ reach within or enter the [enclosure] to service ~~for the purpose of servicing~~ or adjust~~ing~~ the equipment by yourself. Make sure ~~without presence or <assistance> <*AID,HELP*> of~~ another person able to help is with you. ~~capable of <rendering> <*GIVING,MAKING*> aid.~~/1/ Do not depend upon door switches or interlocks for protection. ~~, but~~ always shut down motor generators or other equipment. Do not remove or short circuit ~~Under no circumstances should~~ any access gate, door, or other safety interlock switch. ~~be removed, [short-circuited,] or, [tampered] with in any way , by~~ Only ~~other than~~ authorized maintenance personnel can do this. ~~, nor should [reliance] be <placed> <*PUT*> upon~~ Do not depend on the interlock switches for removing voltages from the equipment./2/
*

```
------------------      READABILITY RESULTS      ----------------------

Number of Sentences         Number of Words        Number of Syllables
        3                         95                       164

Avg. Number of Words per Sentence     Avg. Number of Syllables per Word
             31.66                                  1.72

 GRADE LEVEL    (Based on DOD Readability Standard)
      17.1

------------------      WORDS NOT ON BASIC LIST      -------------------

WORD                   FREQ          WORD                      FREQ

enclosure                1          reliance                     1
short-circuited          1          tampered                     1

-----------------------------NOTES----------------------------------

/  1/  This sentence contains 32 words - consider shortening it.

/  2/  This sentence contains 44 words - consider shortening it.
```

Figure 3. Warnings About Electrical Equipment; Computer Analysis of Original Text with Hand Editing Notes (Grade Level 17.1)



Do not reach within or enter the [enclosure] to service or adjust the equipment by yourself. Make sure another person able to help is with you. Do not depend upon door switches or interlocks for protection; always shut down motor generators or other equipment. Do not remove, or short circuit any access gate, door, or other safety interlock switch. Only authorized maintenance personnel can do this. Do not depend on the interlock switches for removing voltages from the equipment.

```
------------------      READABILITY RESULTS      ----------------------

Number of Sentences        Number of Words         Number of Syllables
        7                        79                       129

Avg. Number of Words per Sentence      Avg. Number of Syllables per Word
               11.28                                 1.63

 GRADE LEVEL   (Based on DOD Readability Standard)
       8.0

------------------      WORDS NOT ON BASIC LIST    ----------------------

WORD                     FREQ            WORD                     FREQ

enclosure                  1
```

Figure 4. Warnings About Electrical Equipment;
Computer Analysis of Revised Text
(Grade Level 8.0)

SECTION III

TEST OF THE COMPUTER READABILITY EDITING SYSTEM

Each feature of the CRES was tested using carefully chosen samples of text representative of a wide variety of Navy training materials and technical manuals. Altogether more than 10,000 words of text (described below) constituted the test passages.

The following paragraphs describe the test materials, specific procedures used to evaluate the CRES, and the results of this evaluation.

TEST PASSAGES

The passages used to test the Common Word List and the word substitution lists included: (1) FORCAST (Caylor, Sticht, Fox, and Ford, 1973) and Kincaid (Kincaid, Fishburne, Rogers, and Chissom, 1975) passages, (2) Naval Sea Systems Command (NAVSEA) passages, and (3) instructional and procedural passages. The test passages, except for the Kincaid and the FORCAST passages, are contained in appendix F. This appendix also contains a listing of source documents from which the passages were taken.

The FORCAST and the Kincaid passages are general test passages taken from a variety of military texts. These test passages were used originally to develop readability formulas specifically for military use and were considered appropriate to test the CRES as well. The overall reading grade level of these passages covered a range of readability levels from the seventh grade to college graduate.

The NAVSEA passages were used to test both the Common Word List and the word substitution lists. These were selected because they are frequently used aboard ship to describe various common operating and maintenance tasks. These are technical manual chapters that cover a wide variety of occupational specialties such as damage control, electronics, lighting, and hazardous materials. The overall reading grade level of these NAVSEA passages is relatively high; the approximate grade levels were from the 12th grade to well above college graduate level.

The procedural and instructional test passages were also used to test both the Common Word List and the word substitution lists. The instructional passages were taken from manuals on such topics as aircraft radar maintenance, uniform regulations, Army equipment operations, and damage control. The procedural passages were taken from missile maintenance instructions and tactical computer maintenance instructions. The readability grade levels for these passages are in the low range; grade levels ranged from the 8th to the 12th grade.

In summary, the test passages cover a wide variety of material that Navy enlisted personnel would have to read. They have been taken from procedural and instructional texts as well as training manuals and were written at a wide range of readability grade levels.

EVALUATION OF CRES FEATURES

READABILITY FORMULA. The readability formula was the first feature of the system to be programmed for the computer and tested. The Flesch-Kincaid Formula is based on the number of sentences, number of words, and number of syllables. An accurate manual count had been made of each of the 18 passages used in the present analysis. Agreement between the manual and computer counts was nearly perfect. Correlation coefficients for each of the pairs of these three factors were above .99.

COMMON WORD LIST. Evaluation of the Common Word List was basically a subjective process. It consisted of judging whether or not words flagged as uncommon did, in fact, appear to be uncommon. Each passage from the test passages was analyzed using the Common Word List. A listing of words not on the Common Word List was printed at the bottom of each analyzed passage. As a result of a subjective judgment by the authors of this report, it was concluded that the Common Word List was sufficiently complete for most purposes. It was judged that fewer than 1 percent of words in the test passages were inappropriately flagged as uncommon.

WORD SUBSTITUTION LISTS. The word substitution lists required a more thorough evaluation than other features of the system because each substitution made in the CRES analysis of the test passages had to be separately judged by a variety of measures. A description of these measures is presented next, followed by the results of the application of these measures to the test passages.

Evaluation Criteria. Three measures were selected to be used as criteria to evaluate the word substitutions:

- the reduction in grade level from a word to its first substitute, where grade level means the lowest grade in which most individuals know the meaning of the word
- the change in specificity from a word to its first substitute, where specificity is determined by the number of different meanings of a word
- the percent of proposed substitutions that were judged accurate, or appropriate.

Reduction in grade level is a measure of special importance because of its relation to the first of the two word requirements stated in DOD-STD-1685(SH). As discussed above, paragraph 4.4.1 of DOD-STD-1685(SH) emphasized that words used in publications should be simple, familiar, and learned early in life. Both the Army List and the Navy Verb List were designed using this concept.

The evaluation was applied to two different units: individual words with their recommended substitutes and entire substitution lists. The list evaluation is valuable in determining how well already-existing substitution lists perform in actual use. The individual word evaluation is valuable in deciding which word and recommended substitute pairs to keep and which to discard. For word evaluation, the different inflected forms were grouped into root words, as described above, and the root word was the unit of evaluation.

Grade Level Reduction. The reduction in grade level from a word to its first substitute was determined by use of The Living Word Vocabulary (Dale and O'Rourke, 1976). This publication is a national inventory of the word knowledge of children and young adults in grades 4, 6, 8, 10, 12, 13, and 16. A grade level was obtained from this source for each word and for each first substitute.[5] This was usually the grade at which at least 67 percent, but less than 85 percent, knew the meaning of the word.[6] The reduction in grade level was obtained by subtracting the substitute's grade level from the word's grade level. After finding the grade level reduction for each word and first substitute pair in this way, the grade level reduction for each list was determined by taking the mean grade level of all word and first substitute pairs in the list.[7] Generally, the lower the grade level of a word, the more familiar it is. When substitutes reduce grade level, they are replacing words with more familiar, simpler substitutes.

Specificity. Change in specificity was determined by referring to specific information contained in Dale and O'Rourke (1976). Words often have several meanings. Dale and O'Rourke listed only what they considered the most common definitions for each word. For each word and for each first substitute, the number of meanings listed in this source was found. Since being specific means that a word has relatively few meanings, the fewer the number of meanings the more specific the word. If a substitute has fewer meanings than the word it replaced, the substitute is more specific than the original word. Conversely, if the substitute has more meanings, it is not as specific as the original word. The change in specificity for an entire list was determined by taking the average number of meanings for words and for first substitutes of the list and then comparing them to find the mean change in specificity for the list.[8,9]

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[5] For a few words or substitutes a grade level was not available. A grade level reduction could not be determined for such cases. When the grade level was missing for either a word or its first substitute, both were excluded from computation of the mean grade level reduction for the list.

[6] Many common words have several meanings. Dale and O'Rourke list all of the commonly used meanings for each word, with a grade level for each meaning. The intended meaning of each word in the Army List and the Navy Verb List was usually obvious when the word was compared to its recommended substitute. Likewise, the intended meaning of each substitute was usually obvious when the substitute was compared to its word. Percent levels of 67-85 were arbitrarily chosen by the authors.

[7] The N for this mean was the total number of word forms in the list minus the number of pairs which were excluded. The number of pairs excluded from the Army List was 123 of 727, and the number excluded from the Navy Verb List was 152 of 431.

Percent of Accurate Substitutions. The appropriateness of word substitution was rated by two TAEG personnel assigned to the computer readability editing project using a rating scale which featured a forced-choice (accurate vs. inaccurate) decision plus an assessed degree of the accuracy or inaccuracy.

The rating of accuracy of a substitution was based on whether the substitute would have the same meaning in the context of the passage as the original word and would fit the sentence well. Whether the substitution made reading easier was judged by grade level reduction and specificity; thus, accuracy was judged by similarity of substitutes. Only the word with the higher rating was used because writers would use only the better substitute.

Evaluation of Two Word Substitution Lists. The Army List and the Navy Verb List were evaluated for specificity, grade level reduction, and percent of accurate substitutions. Separate measures were kept for three types of passages: NAVSEA, procedural, and instructional. As mentioned above, the NAVSEA manual is a widely used document containing both procedural and instructional passages.

Grade Level Reduction. For the Army List the mean grade level reduction from a word to its first substitute was 7.9 to 5.0, a mean reduction of 2.9 grade levels. For the Navy Verb List the mean grade level reduction from a word to its first substitute was 7.1 to 4.9, a mean reduction of 2.2 grade levels. The grade level reduction was greatest for the Army List, but both lists showed substantial reductions.

Specificity. The mean change in specificity from a word to its first substitute for the Army List was from 1.98 meanings to 4.27 meanings, an increase of 2.29 meanings. For the Navy Verb List this same change was from 2.66 meanings to 3.86 meanings, an increase of 1.20 meanings. For both lists, going from words to their substitutes caused an increase in generality although reducing grade level.

---

[8] Some words and some first substitutes were not listed by Dale and O'Rourke (1976). When either a word or its first substitute was missing, both were excluded from computation of the mean change in specificity for their list. The number of excluded pairs for the Army List was 22 and for the Navy Verb List was 34. This mean was based on the number of words in the original substitution lists prior to expansion. The Ns were then, for the Army List, 183 minus 22 and for the Navy Verb List, 108 minus 34.

[9] Dale and O'Rourke (1976) did not list all meanings of each word. Using criteria of their own they apparently selected enough meanings of each word to cover its usual uses. The selection of different meanings is discussed by Dale and O'Rourke on page III of the introduction. Because not all meanings were used, the number of meanings listed by these authors might not be an interval scale of specificity; this measure should be an excellent approximation to specificity, however, at the rank-order level or better.

Tradeoff Between Grade Level Reduction and Specificity. There was a tradeoff between lists in these measurements. The Army List achieved the most grade level reduction but at the cost of specificity. The Navy Verb List was more specific but had less grade level improvement. The substitutes were more familiar and simple but less specific than the words they replaced. Thus, the substitution lists moved in the direction of the first requirement of DOD-STD-1685(SH) but did not move in the direction of the second requirement. That only one of these measures moved in the desired direction is not surprising. Common words usually have more meanings than uncommon words; therefore, to increase familiarity is usually to reduce specificity. Some substitutes satisfied one requirement while others satisfied the other requirement, but most reduced grade level.

Percent of Accurate Substitutions. Table 6 shows the percent of proposed substitutions which were judged accurate. The values in the table are the means of two raters. Separate values were calculated for each list and kind of text.

TABLE 6. PERCENT OF PROPOSED SUBSTITUTIONS JUDGED ACCURATE AND NUMBER OF PROPOSED SUBSTITUTIONS (BY LIST AND TEST SELECTION)

List	Type of Text			Overall
	NAVSEA	Procedural	Instructional	
Army				
No. Proposed Substitutions	112	103	125	340
Percent of Accurate Substitutions	71.0%*	77.2%*	80.4%*	76.2%**
Navy Verb				
No. Proposed Substitutions	50	129	43	222
Percent of Accurate Substitutions	46.0%*	66.0%*	74.0%*	66.1%**

* The percent was computed for each rater and then averaged over the two raters.

** The total number of accurate substitutions divided by the total number of proposed substitutions for each rater, averaged for the two raters.

For each text selection the Army List was higher in accuracy of substitutions than the Navy Verb List with an overall difference between the two lists of 13.2 percent. The Navy Verb List had an especially low percentage of accurate substitutions when used with the NAVSEA text. The Army List also had its lowest percent of accurate substitutions when used with the NAVSEA text, but the difference between this percentage and those with the other two text selections was less severe with the Army List than with the Navy Verb List.

The test of the Army List showed it to give accurate substitutes with reasonably good success--three of four proposed substitutions had the correct meaning. Also, its percent of accurate substitutions was fairly consistent over different sources of text.

The Army List made more than 1½ times as many proposed substitutions, overall, as the Navy Verb List made, presumably because the Army List is longer and is not restricted to verbs.

The Navy Verb List made many more proposed substitutions when it was used with the procedural text than when used with either of the other two types of text--three times the number of proposed substitutions made with the instructional text and over 2½ times the number made with the NAVSEA text. That this was not due to the procedural text being longer can be seen by looking at the number of proposed substitutions made by the Army List--fewer with the procedural text than with the other two selections. The Navy Verb List's increased number of proposed substitutions when used with the procedural text was probably related to the criteria guiding the list's construction.

In comparing the Army List and the Navy Verb List, the Army List produced the largest grade level reduction, the highest overall percent of accurate substitutions, and the greatest overall frequency of accurate substitutions. The Navy Verb List proved to be more specific than the Army List.

The Army List produces simple words as substitutes, produces them in fair numbers, and with reasonable accuracy. Also, it seems to perform consistently when used with text selections from different sources. The only problem associated with its use is that the substitutions usually are more general than the words replaced. The Army List seems to be reliable and useful in a variety of situations.

The Navy Verb List seems to have its greatest usefulness with a particular type of material--highly technical writing, such as descriptions of procedures to be followed. This list produces many proposed substitutions when used with such material and produces them with sufficient accuracy. (It was competitive with the Army List on this type of material.) Thus, the Navy Verb List seems to be more specialized than the Army List, working best on the material for which it was apparently designed.

This evaluation of the Army List and the Navy Verb List has been based on the complete lists. Modifications of the lists might result in still better performance.

SECTION IV

CONCLUSIONS AND RECOMMENDATIONS

This section contains conclusions about operation of the prototype system and recommendations for its use by the Navy for improving the quality of training materials and technical manuals.

CONCLUSIONS

Specific conclusions regarding operation of the system are given below.

1. The particular configuration of hardware used in the prototype system represents a reasonable cost (about $40,000) and produces analyses with sufficient speed to be useful in a production context.

2. The computerization of the Flesch-Kincaid Readability Formula has the potential for saving considerable time in the verification and control of readability grade levels for technical manuals produced under military contract. This formula is the DOD standard for readability measurement (MIL-M-38784A, Amendment 5, 24 July 1978), making its use a frequent contractual requirement imposed by the Army and Navy.

3. The feature of the system which flags long sentences appears to satisfactorily encourage writers and editors to rewrite and improve such sentences.

4. The Common Word List and Supplementary Technical Lists appear to be reasonably complete. Flagged words were judged to actually be uncommon. An interesting by-product of the Common Word List is that it aids in detecting misspelled words as they may be flagged as uncommon. This feature should prove useful during the proofreading of the text.

5. The word substitution feature of the system may be the most helpful feature to the writer or editor in that it gives the most concrete suggestion for rewriting. Suggested substitutes in the two lists tested gave correct meanings and were simpler than the words they replaced.

There are two military requirements for word use according to DOD-STD-1685(SH): words should be simple and they should be specific. Both of the word substitution lists tested satisfied the first requirement, but neither of them satisfied the second requirement. It would be almost impossible for word substitution lists to bring about improvement on both of these requirements simultaneously, since simplicity and specificity in words tend to be negatively related. Development of future word substitution lists will have to be based on a compromise between these two requirements.

6. The Navy Verb List works best with a certain type of manual--procedures to be followed. With this type of text, the Navy Verb List produces a greater number of accurate substitutions per 100 words of text than the Army List.

7. Users of the system will have to add to the word lists, particularly the supplementary technical lists, to fit unique needs. Some users will need to construct additional word lists for special purposes.

RECOMMENDATIONS

1. The CRES should now be placed in an operational context to insure its applicability. Several military agencies have expressed an interest in using and further developing the system.

2. A cost-benefit analysis should be conducted as part of the operational test of the system.

3. An on-line editing capability should be added to the CRES. The computer program's efficiency should be increased and made transportable between various makes of computer equipment.

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APPENDIX A

THE COMMON WORD LIST

This is the root-word form of the Common Word List. The expanded form of this list was the form actually used for processing in TAEGs computer readability editing system.

A
ABANDON
ABBREVIATION
ABILITY
ABLE
ABNORMAL
ABOARD
ABOUT
ABOVE
ABRASIVE
ABSENCE
ABSENT
ABSOLUTE
ABSORB
ABUSE
ABUSER
ACCELERATE
ACCEPT
ACCEPTABLE
ACCESS
ACCESSORY
ACCIDENT
ACCOMPLISH
ACCORD
ACCORDANCE
ACCORDING
ACCOUNT
ACCOUNTING
ACCUMULATE
ACCURACY
ACCURATE
ACCUSE
ACID
ACKNOWLEDGE
ACOUSTIC
ACRE
ACROSS
ACT
ACTION
ACTIVATE
ACTIVE
ACTIVITY
ACTUAL
ACTUATE
ADAPT
ADAPTABLE
ADD
ADDITION
ADDITIONAL
ADDITIVE
ADDRESS
ADEQUATE
ADHESIVE
ADJECTIVE
ADJUST
ADJUSTMENT
ADMINISTER
ADMINISTRATION
ADMINISTRATIVE
ADVANCE
ADVANCEMENT
ADVANTAGE
ADVERB
ADVERTISEMENT
ADVISE
AFAR
AFFAIR
AFFECT
AFLOAT
AFT
AFTER
AFTERNOON
AFTERWARD
AGAIN
AGAINST
AGE
AGED
AGENT
AGGREGATE
AGO
AGREE
AGREEMENT
AHEAD
AID
AIM
AIR
AIRBORNE
AIRCRAFT
AIRFIELD
AIRPLANE
AIRPORT
AIRSHIP
AIRSPEED
AIRY
ALARM
ALCOHOL
ALCOHOLIC
ALCOHOLISM
ALERT
ALGEBRA
ALGEBRAIC
ALGORITHM
ALIGN
ALIGNMENT
ALIKE
ALL
ALLIES
ALLOCATE
ALLOW
ALLOWANCE
ALLOY
ALMOST
ALONE
ALONG
ALONGSIDE
ALOUD
ALPHABET
ALPHABETIC
ALPHANUMERIC
ALREADY
ALSO
ALTER
ALTERNATE
ALTHOUGH
ALTIMETER
ALTITUDE
ALUMINUM
ALWAYS
AM
AMERICAN
AMIDSHIPS
AMMONIA
AMMUNITION
AMONG
AMOUNT
AMPERAGE
AMPERE
AMPHIBIOUS
AMPLIFIER
AMPLIFY
AMPLITUDE
AMUSEMENT
AN
ANALOG
ANALYSIS
ANALYST
ANALYZE
ANCHOR
AND
ANGLE

ANGRY
ANIMAL
ANNEAL
ANNOTATE
ANOTHER
ANSWER
ANT
ANTENNA
ANTHEM
ANTISUBMARINE
ANY
ANYBODY
ANYHOW
ANYONE
ANYTHING
ANYWAY
ANYWHERE
APART
APIECE
APOSTROPHE
APPARATUS
APPEAR
APPEARANCE
APPLE
APPLICABLE
APPLICANT
APPLICATION
APPLY
APPOINT
APPREHEND
APPRENTICESHIP
APPROACH
APPROPRIATE
APPROVAL
APPROVE
APPROVED
APPROXIMATE
APRIL
APRON
APTITUDE
ARC
ARCH
ARE
AREA
ARGUMENT
ARISE
ARITHMETIC
ARM
ARMAMENT
ARMFUL

ARMOR
ARMS
ARMY
AROSE
AROUND
ARRANGE
ARRANGEMENT
ARRAY
ARREST
ARRIVE
ARROW
ART
ARTICLE
ARTIFICIAL
ARTILLERY
AS
ASCEND
ASHORE
ASIDE
ASK
ASSAULT
ASSEMBLE
ASSEMBLY
ASSIGN
ASSIGNMENT
ASSIST
ASSISTANCE
ASSISTANT
ASSOCIATE
ASSUME
ASTERISK
ASTERN
ASYNCHRONOUS
AT
ATMOSPHERE
ATOM
ATTACH
ATTACK
ATTEMPT
ATTEND
ATTENTION
ATTENUATE
ATTITUDE
ATTRACTION
AUDIBLE
AUDIT
AUGUST
AUTHENTICATE
AUTHORITY
AUTHORIZE

AUTO
AUTOMATIC
AUTOMATICALLY
AUTOMOBILE
AUXILIARY
AVAIL
AVAILABLE
AVERAGE
AVIATION
AVOID
AWAKE
AWARD
AWAY
AWHILE
AX
AXIS
AYE
AZIMUTH
BABY
BACK
BACKGROUND
BACKUP
BACKWARD
BACKWARDS
BAD
BADGE
BAG
BAKE
BAKING
BALANCE
BALL
BALLISTIC
BALLOON
BAND
BANDAGE
BANG
BANK
BAR
BARE
BARGE
BARREL
BASE
BASEMENT
BASIC
BASIN
BASIS
BASKET
BAT
BATCH
BATH

BATHE
BATTERY
BATTLE
BATTLESHIP
BAY
BE
BEACH
BEACON
BEAD
BEAM
BEAN
BEAR
BEARING
BEAT
BEAUTIFUL
BECAME
BECAUSE
BECOME
BECOMING
BED
BEE
BEEN
BEFORE
BEGAN
BEGIN
BEGINNING
BEGUN
BEHAVIOR
BEHIND
BEING
BELIEF
BELIEVE
BELL
BELONG
BELOW
BELT
BENCH
BEND
BENEATH
BENEFIT
BENT
BERRY
BERTH
BESIDE
BESIDES
BEST
BET
BETTER
BETWEEN
BEYOND

BIAS
BIDIRECTIONAL
BIG
BILGE
BILL
BILLET
BIN
BINARY
BIND
BINDER
BINOCULARS
BIOLOGICAL
BIRD
BIRTH
BIT
BITE
BITING
BITTEN
BITTER
BLACK
BLACKBOARD
BLADE
BLANK
BLANKET
BLAST
BLAZE
BLED
BLEED
BLEW
BLIND
BLINDFOLD
BLOCK
BLOOD
BLOT
BLOW
BLOWN
BLUE
BLUEPRINT
BLUR
BOARD
BOAT
BOATSWAIN
BOB
BODY
BOIL
BOILER
BOILING
BOLT
BOMB
BOND

BONE
BOOK
BOOM
BOOST
BOOT
BORE
BORESIGHT
BORNE
BORROW
BOTH
BOTTLE
BOTTOM
BOUGHT
BOUNCE
BOW
BOWL
BOX
BOXCAR
BOY
BRAID
BRAIN
BRAKE
BRAKING
BRANCH
BRASS
BRAZE
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WRITTEN
WRONG
WROTE
WRUNG
YARD
YARN
YAW
YEAR
YELL
YELLOW
YES
YESTERDAY
YET
YIELD
YOLK
YOU
YOUNG
YOUR
YOURSELF
YOURSELVES
ZEBRA
ZERO
ZONE

APPENDIX B

THE BASIC NAVY WORD LIST

This is the root-word form of the Basic Navy Word List. This list was combined with five others to form the Common Word List.

A
ABANDON
ABILITY
ABLE
ABOARD
ABOUT
ABOVE
ABSENCE
ABSENT
ABUSE
ABUSER
ACCESS
ACCIDENT
ACCOMPLISH
ACCORDANCE
ACCORDING
ACCOUNTING
ACCURACY
ACCURATE
ACCUSE
ACID
ACKNOWLEDGE
ACROSS
ACT
ACTION
ACTIVE
ACTIVITY
ACTUAL
ADD
ADDITION
ADDRESS
ADEQUATE
ADJUST
ADJUSTMENT
ADMINISTER
ADVANCE
AFFAIR
AFFECT
AFLOAT
AFT
AFTER
AGAIN
AGAINST
AGE
AGENT
AHEAD
AID
AIM
AIR
AIRBORNE
AIRCRAFT
ALARM
ALCOHOL
ALERT
ALIGNMENT
ALL
ALLIES
ALLOW
ALLOWANCE
ALMOST
ALONE
ALONG
ALONGSIDE
ALPHABET
ALREADY
ALSO
ALTHOUGH
ALTITUDE
ALUMINUM
ALWAYS
AM
AMERICAN
AMIDSHIPS
AMMONIA
AMMUNITION
AMONG
AMOUNT
AMPHIBIOUS
AN
ANCHOR
AND
ANGLE
ANOTHER
ANSWER
ANTHEM
ANTISUBMARINE
ANY
ANYONE
ANYTHING
APART
APPARATUS
APPEAR
APPEARANCE
APPLICABLE
APPLY
APPOINT
APPREHEND
APPRENTICESHIP
APPROACH
APPROPRIATE
APPROVAL
APPROVE
APPROXIMATE
APTITUDE
ARE
AREA
ARM
ARMAMENT
ARMOR
ARMS
ARMY
AROUND
ARREST
ARTICLE
ARTIFICIAL
AS
ASHORE
ASK
ASSAULT
ASSEMBLY
ASSIGN
ASSIGNMENT
ASSIST
ASSISTANCE
ASSOCIATE
ASSUME
ASTERN
AT
ATMOSPHERE
ATTACH
ATTACK
ATTEMPT
ATTEND
ATTENTION
AUTHORITY
AUTOMATIC
AUXILIARY
AVAILABLE
AVERAGE
AVIATION
AVOID
AWARD
AWAY
AYE
BACK
BACKGROUND
BAD
BADGE
BAG
BALLISTIC

BAND
BANDAGE
BARGE
BARREL
BASE
BASIC
BASIS
BASKET
BATTERY
BATTLE
BATTLESHIP
BE
BEACH
BEAM
BEARING
BECAUSE
BECOME
BEEN
BEFORE
BEGIN
BEHIND
BEING
BELL
BELOW
BELT
BEND
BENEFIT
BERTHING
BESIDES
BEST
BETTER
BETWEEN
BEYOND
BIG
BILGE
BILL
BILLET
BINOCULARS
BIOLOGICAL
BIRTH
BITTER
BLACK
BLANKET
BLAST
BLEED
BLOCK
BLOOD
BLOW
BLUE
BOARD

BOAT
BOATSWAIN
BODY
BOILER
BOLT
BOMB
BONE
BOOK
BOOM
BOTH
BOTTOM
BOW
BOX
BOY
BRAID
BREAK
BREAST
BREATH
BREATHE
BRIDGE
BRIEF
BRIGHT
BRING
BRISTLE
BRITISH
BROAD
BROKEN
BROUGHT
BRUSH
BUILDING
BUILT
BULKHEAD
BUNK
BUOY
BUREAU
BURN
BURST
BUSINESS
BUT
BUTTON
BY
CABLE
CADENCE
CALIBER
CALL
CAME
CAMP
CAN
CANDIDATE
CANISTER

CANNISTER
CANNOT
CANS
CANVAS
CAP
CAPABILITY
CAPABLE
CAPACITY
CAPSTAN
CAPTAIN
CAPTURE
CARBON
CARD
CARE
CAREER
CAREFUL
CARGO
CARRIER
CARRY
CARTRIDGE
CASE
CASUALTY
CATCH
CATEGORY
CAUSE
CAUTION
CELESTIAL
CENTER
CENTERLINE
CENTRAL
CEREMONY
CERTAIN
CERTIFICATE
CHAIN
CHAMBER
CHAMBRAY
CHANCE
CHANGE
CHAPLAIN
CHAPTER
CHARACTERISTIC
CHARGE
CHART
CHECK
CHEMICAL
CHEST
CHIEF
CHILDREN
CHOCK
CHOKE

CHURCH
CIRCLE
CIRCUIT
CIRCUMSTANCE
CITIZEN
CITY
CIVIL
CIVILIAN
CLASS
CLASSIFICATION
CLEAN
CLEANLINESS
CLEAR
CLEARANCE
CLEAT
CLERICAL
CLICK
CLOCKWISE
CLOSE
CLOSURE
CLOTH
CLOTHES
CLOTHING
COAST
COAT
CODE
COIL
COLD
COLLAR
COLLEGE
COLLISION
COLOR
COLUMN
COMBAT
COMBATANT
COMBINATION
COMBINE
COMBUSTION
COME
COMFORTABLE
COMMAND
COMMENDATION
COMMERCIAL
COMMISSION
COMMIT
COMMON
COMMUNICATION
COMPANY
COMPARE
COMPARTMENT
COMPASS
COMPLAINT
COMPLETE
COMPLEX
COMPLICATE
COMPONENT
COMPOSE
COMPRESS
COMPUTER
CONCENTRATE
CONCERN
CONDITION
CONDUCT
CONFINE
CONFUSION
CONGRESS
CONNECT
CONSEQUENCE
CONSIDER
CONSIST
CONSTANT
CONSTITUTION
CONSTRUCTION
CONTACT
CONTAIN
CONTAMINATE
CONTINUE
CONTROL
CONVENTION
CONVERT
CONVULSION
COOL
COORDINATION
CORD
CORNER
CORPS
CORRECT
CORRESPONDENCE
COST
COTTON
COULD
COUNSEL
COUNTERMEASUURE
COUNTRY
COUPLING
COURSE
COURT
COVER
COXSWAIN
CRAFT
CRAMP
CREATE
CREDIT
CREW
CRITICAL
CROSS
CRUISE
CRUISER
CURRENT
CUSTODY
CUSTOM
CUT
CYCLE
DAILY
DAMAGE
DANGER
DANGEROUS
DARK
DATA
DATE
DAVIT
DAY
DAYTIME
DEAD
DEAR
DEATH
DEBRIS
DECK
DECONTAMINATION
DECORATION
DEEP
DEFENSE
DEFINE
DEGREE
DELIVER
DEMOCRACY
DENTAL
DEPARTMENT
DEPEND
DEPENDENCE
DEPTH
DEPUTY
DESCRIBE
DESERTION
DESIGN
DESIGNATE
DESIRE
DESPITE
DESTROY
DESTRUCTION

DETACHMENT
DETAIL
DETECT
DETECTION
DETERMINE
DEVELOP
DEVIATION
DEVICE
DEWATER
DIAMETER
DID
DIESEL
DIFFERENCE
DIFFICULT
DIGIT
DIOXIDE
DIRECT
DIRECTION
DIRT
DISABILITY
DISASTER
DISBURSE
DISCHARGE
DISCIPLINARY
DISCRETION
DISCUSS
DISEASE
DISPLACE
DISPOSAL
DISTANCE
DISTRESS
DISTRICT
DIVE
DIVIDE
DIVINE
DIVISION
DO
DOCK
DOG
DONE
DOOR
DOSE
DOUBLE
DOUBT
DOWN
DRAFT
DRAW
DRAWN
DRESS
DRILL

DRINK
DRIVE
DRIVEN
DROP
DRUG
DRUNK
DRY
DUE
DURING
DUST
DUTY
DYE
EACH
EAGLE
EARLY
EARN
EARTH
EASILY
EAST
EASY
EAT
EDGE
EDUCATION
EDUCTOR
EFFECT
EFFECTIVE
EFFICIENCY
EFFORT
EIGHT
EITHER
ELASTIC
ELBOW
ELECTRIC
ELECTRONIC
ELIGIBILITY
ELIGIBLE
ELSE
EMBARK
EMERGENCY
EMPLOYMENT
EMPTY
ENABLE
END
ENEMY
ENERGY
ENGAGE
ENGINE
ENGINEER
ENGINEROOM
ENLIST

ENLISTMENT
ENOUGH
ENSIGN
ENSURE
ENTER
ENTIRE
ENTITLE
ENTRANCE
ENTRY
EQUAL
EQUIP
EQUIPMENT
ERROR
ESCAPE
ESCORT
ESPECIALLY
ESSENTIAL
ESTABLISH
EVALUATE
EVEN
EVENING
EVENT
EVENTUALLY
EVER
EVERY
EVERYONE
EVERYTHING
EXACT
EXAMINATION
EXAMPLE
EXCELLENT
EXCEPT
EXCEPTION
EXCESS
EXCESSIVE
EXCHANGE
EXECUTE
EXECUTION
EXERCISE
EXHAUST
EXIST
EXPECT
EXPERIENCE
EXPIRATION
EXPLOSION
EXPOSE
EXPOSURE
EXTEND
EXTENSIVE
EXTENT

EXTERNAL
EXTINGUISH
EXTRA
EXTREME
EYE
FACE
FACEPIECE
FACILITY
FACT
FACTOR
FAIL
FAILURE
FAIR
FAKE
FALL
FALLOUT
FALSE
FAMILIAR
FAMILY
FANTAIL
FAR
FAST
FASTEN
FATAL
FATHOM
FEATURE
FEDERAL
FEEL
FEET
FELLOW
FEMALE
FEW
FIBER
FIELD
FIGHT
FIGHTER
FIGURE
FILE
FILL
FINAL
FINANCIAL
FIND
FINE
FINGER
FIRE
FIREBALL
FIREFIGHTING
FIREPLUG
FIRM
FIRST
FISCAL
FIT
FIVE
FIX
FLAG
FLAME
FLAMMABLE
FLARE
FLASH
FLAT
FLEET
FLIGHT
FLOATING
FLOOD
FLOW
FLOWN
FLUID
FLY
FOAM
FOCUS
FOG
FOLD
FOLLOW
FOOD
FOOT
FOR
FORCE
FORE
FOREARM
FORECASTLE
FOREIGN
FORM
FORMAL
FORMER
FORTH
FORWARD
FOUND
FOUR
FOURTH
FRACTURE
FRAME
FREE
FREQUENT
FRESH
FRIGATE
FROM
FRONT
FUEL
FULL
FUME
FUNCTION
FURTHER
FUZE
GAIN
GAMMA
GANGWAY
GAS
GASOLINE
GEAR
GENERAL
GENERATOR
GET
GIVE
GIVEN
GLASS
GLOVE
GOGGLES
GOLD
GOOD
GOVERNMENT
GRADE
GRADUAL
GRANT
GRASP
GRAY
GREASE
GREAT
GREEN
GROOM
GROUND
GROUP
GUARD
GUIDANCE
GUIDE
GUIDELINES
GUILT
GUN
GUNFIRE
GUNNERY
HAD
HAIR
HALF
HAMMER
HAND
HANDLE
HANDLING
HANDS
HANG
HANGAR
HARBOR

HARD
HARDSHIP
HARM
HARMFUL
HARNESS
HARPOON
HAS
HAT
HATCH
HAUL
HAVE
HAZARD
HAZARDOUS
HE
HEAD
HEADQUARTERS
HEADSET
HEALTH
HEAR
HEART
HEAT
HEAVING
HEAVY
HEEL
HEIGHT
HELD
HELICOPTER
HELMSMAN
HELP
HER
HERE
HIGH
HIGHLINE
HIM
HIMSELF
HIS
HISTORY
HIT
HITCH
HOIST
HOLD
HOME
HOMING
HONOR
HONORABLE
HOOK
HORIZON
HORN
HOSE
HOSPITAL

HOT
HOUR
HOUSEFALL
HOUSING
HOW
HOWEVER
HULL
HUMAN
HUNDRED
HYDRAULIC
HYGIENE
IDEA
IDENTIFICATION
IMMEDIATE
IMPORTANCE
IMPOSE
IMPOSSIBLE
IN
INACTIVE
INBOARD
INCENTIVE
INCH
INCLUDE
INCREASE
INDICATE
INDIVIDUAL
INFECTION
INFLUENCE
INFORMATION
INITIAL
INJURE
INJURY
INNER
INSIDE
INSIGNIA
INSPECT
INSTALL
INSTANCE
INSTANT
INSTEAD
INSTRUCTION
INSTRUMENT
INSURANCE
INTEGRITY
INTELLIGENCE
INTEND
INTENSE
INTENT
INTERCEPT
INTEREST

INTERFERE
INTERIOR
INTERMEDIATE
INTERNAL
INTERVAL
INTO
INTRODUCE
INVESTIGATION
INVOLVE
IS
ISOLATE
ISSUE
IT
ITEM
ITSELF
JACK
JACKBOX
JACKET
JAW
JET
JOB
JOIN
JOINT
JUDGE
JUMPER
JUNIOR
JURISDICTION
JUST
JUSTICE
KEEP
KEPT
KEY
KILL
KIND
KIT
KNEE
KNOCK
KNOT
KNOW
KNOWLEDGE
KNOWN
LABORATORY
LADDER
LAID
LAMP
LAND
LANDING
LANGUAGE
LARGE
LAST

LATE
LAUNCH
LAUNCHER
LAW
LAWFUL
LAY
LEAD
LEADER
LEADERSHIP
LEARN
LEAST
LEAVE
LED
LEE
LEFT
LEG
LEGAL
LENGTH
LENS
LESS
LET
LETTER
LEVEL
LIBERTY
LIE
LIEUTENANT
LIFE
LIFEBOAT
LIFT
LIGHT
LIGHTERS
LIGHTWEIGHT
LIKE
LIMIT
LINE
LINK
LIQUID
LIST
LITTLE
LIVE
LIVES
LOAD
LOCAL
LOCATE
LOCATION
LOCKER
LOG
LONG
LOOK
LOOKOUT
LOOP
LOOSE
LORAN
LOSE
LOSS
LOST
LOT
LOW
LOWER
LUNG
LYING
MACHINE
MADE
MAGAZINE
MAGNESIUM
MAGNETIC
MAIL
MAIN
MAINTAIN
MAINTENANCE
MAJOR
MAJORITY
MAKE
MALE
MAN
MANAGEMENT
MANEUVER
MANNER
MANUAL
MANY
MARCH
MARINE
MARK
MARTIAL
MASK
MAST
MASTER
MATCH
MATE
MATERIAL
MATTER
MAXIMUM
MAY
MEAL
MEAN
MEASURE
MECHANICAL
MEDAL
MEDICAL
MEET
MEMBER
MEN
MENTAL
MENTION
MERCHANT
MERELY
MERITORIOUS
MESS
MESSAGE
MESSENGER
MESSING
METAL
METER
METHOD
MIDWAY
MIGHT
MILE
MILITARY
MIND
MINE
MINIMUM
MINOR
MINORITY
MINUTE
MISCONDUCT
MISSILE
MISSION
MODERN
MODIFY
MONEY
MONITOR
MONKEY
MONTH
MOOR
MORAL
MORALE
MORE
MORNING
MORPHINE
MOST
MOTION
MOTOR
MOUNT
MOUTH
MOVE
MOVEMENT
MUCH
MUST
MUSTARD
MUSTER

MY
NAKED
NAME
NAMEPLATE
NARCOTIC
NARROW
NATION
NATIONAL
NATURAL
NATURE
NAUSEA
NAUTICAL
NAVAL
NAVIGATION
NAVY
NEAR
NEAT
NECESSARILY
NECK
NEED
NEEDLE
NEITHER
NERVE
NERVOUS
NEVER
NEW
NEXT
NIGHT
NINE
NO
NOISE
NONCOMMISSIONED
NOR
NORMAL
NORTH
NOSE
NOT
NOTE
NOTHING
NOTICE
NOW
NOZZLE
NUCLEAR
NUMBER
NUMEROUS
NURSE
NYLON
O'CLOCK
OBEY
OBJECT

OBLIGATE
OBSERVE
OBTAIN
OCCASION
OCCUPATIONAL
OCCUR
OCEAN
ODD
OF
OFF
OFFENDER
OFFENSE
OFFICE
OFFICER
OFFICIAL
OFTEN
OIL
OLD
ON
ONCE
ONE
ONLY
OPEN
OPENING
OPERATE
OPERATION
OPERATOR
OPPORTUNITY
OPPOSITE
ORAL
ORAL
ORDER
ORDINARY
ORDNANCE
ORGANIZATION
ORIGINAL
OTHER
OTHERWISE
OUR
OUT
OUTBOARD
OUTER
OUTFIT
OUTLET
OUTLINE
OUTSIDE
OUTSTANDING
OVER
OVERBOARD
OVERHEAD

OVERSEAS
OWN
OXYGEN
PACIFIC
PAD
PAGE
PAID
PAIN
PAINT
PAINTER
PAPER
PARACHUTE
PARALLEL
PART
PARTICIPATE
PARTICLE
PARTICULAR
PARTY
PASS
PASSENGER
PASSIVE
PAST
PATIENT
PATROL
PAY
PAYGRADE
PAYMENT
PEACE
PEACETIME
PECULIAR
PENNANT
PEOPLE
PER
PERCENT
PERFORM
PERIOD
PERIODICALLY
PERMANENT
PERMISSION
PERMIT
PERSON
PERSONAL
PERSONNEL
PETTY
PHASE
PHONE
PHONETIC
PHYSICAL
PICK
PICTURE

PIECE
PIER
PILOT
PIN
PIPE
PIPING
PITCH
PLACE
PLAIN
PLAN
PLANE
PLANT
PLASTIC
PLATFORM
PLATING
PLAY
PLOT
PLUG
PLUS
POCKET
POINT
POISON
POISONOUS
POLICE
POLICY
POOR
PORT
PORTABLE
PORTION
POSITION
POSSESSION
POSSIBILITY
POSSIBLE
POST
POTENTIAL
POUND
POWDER
POWER
POWERFUL
PRACTICAL
PRECAUTION
PRECEDENCE
PRECEDING
PREPARATION
PREPARE
PRESCRIBED
PRESENCE
PRESENT
PRESERVATION
PRESIDENT
PRESS
PRESSURE
PREVENT
PRIMARILY
PRIMARY
PRINCIPAL
PRINT
PRIOR
PRISONER
PRIVATE
PROBABLY
PROBLEM
PROCEDURE
PROCEED
PROCESS
PRODUCE
PROFESSIONAL
PROGRAM
PROHIBIT
PROJECTILE
PROMOTION
PROMPT
PROPEL
PROPELLER
PROPER
PROPERTY
PROPORTIONER
PROPULSION
PROTECT
PROVIDE
PROVISION
PUBLIC
PUBLICATION
PULL
PULSE
PUMP
PUNISH
PUNISHMENT
PURPOSE
PUSH
PUT
QUALIFICATION
QUALIFY
QUARTER
QUESTION
QUICK
QUIET
RADAR
RADIATION
RADIO
RADIOACTIVE
RAG
RAINCOAT
RAISE
RAMP
RANGE
RANK
RAPID
RATE
RATHER
RATING
RATION
RAY
REACH
REACTOR
READ
READILY
READINESS
READY
REAL
REAR
REASON
REASONABLE
RECEIPT
RECEIVE
RECOGNITION
RECOMMEND
RECORD
RECOVERY
RECRUIT
RED
REDUCE
REDUCTION
REENLIST
REFER
REGARDLESS
REGULAR
REGULATION
REHABILITATION
RELATE
RELATIVE
RELEASE
RELIEF
RELIEVE
REMAIN
REMEMBER
REMOVE
RENDER
REPAIR
REPEAT

REPLACE
REPLENISHMENT
REPORT
REPRESENT
REQUEST
REQUIRE
RESCUE
RESEARCH
RESERVE
RESERVIST
RESIST
RESPECT
RESPIRATION
RESPONSIBILITY
REST
RESTRAINT
RESTRICT
RESULT
RETIRE
RETIREMENT
RETURN
REVEILLE
REVERSE
RIBBON
RIFLE
RIG
RIGHT
RING
RISE
RIVER
RIVERINE
ROCKET
ROLL
ROOM
ROPE
ROUGH
ROUND
ROUTINE
RUBBER
RUDDER
RULE
RUN
RUST
SABOTAGE
SAFE
SAFETY
SAID
SAILOR
SALT
SALUTE
SALVAGE
SAME
SANITATION
SAVE
SAY
SCALE
SCENE
SCHEDULE
SCHOOL
SCOPE
SCORE
SCREW
SEA
SEAL
SEAMAN
SEAMANSHIP
SEARCH
SEAT
SECOND
SECONDARY
SECRET
SECRETARY
SECTION
SECTOR
SECURE
SECURITY
SEE
SEEK
SEEM
SEEN
SEIZE
SELDOM
SELECT
SELECTION
SELECTOR
SELF
SEMAPHORE
SEND
SENIOR
SENSE
SENT
SENTENCE
SENTRY
SEPARATE
SEQUENCE
SERIES
SERIOUS
SERVE
SERVICE
SET
SEVEN
SEVERAL
SEVERE
SHAFT
SHALL
SHALLOW
SHAPE
SHARP
SHE
SHELL
SHELTER
SHIFT
SHIP
SHIPBOARD
SHIPMATE
SHIRT
SHOCK
SHOE
SHOOT
SHOP
SHORE
SHORT
SHOT
SHOULD
SHOULDER
SHOW
SHOWN
SICK
SIDE
SIGHT
SIGN
SIGNAL
SIGNALMAN
SIGNIFICANT
SILENCE
SIMILAR
SIMPLE
SIMPLY
SINCE
SINGLE
SIR
SISTER
SITUATION
SIX
SIZE
SKILL
SKIN
SKY
SLACK
SLEEVE

SLIDE
SLIGHT
SLING
SLIP
SLOW
SMALL
SMART
SMOKE
SMOOTH
SNOW
SO
SOAP
SOCIAL
SOCKS
SOFT
SOLID
SOLUTION
SOLVENT
SOME
SOMEONE
SOMETHING
SOMETIMES
SOMEWHAT
SONAR
SOON
SOUND
SOURCE
SOUTH
SPACE
SPAN
SPAR
SPARE
SPARK
SPEAK
SPECIAL
SPECIFIC
SPECIFY
SPEED
SPLICE
SPLINT
SPOKEN
SPORT
SPOT
SPREAD
SPRING
SQUADRON
SQUARE
SQUEEZE
STABILITY
STAFF
STAGE
STAND
STANDARD
STANDBY
STAR
STARBOARD
START
STATE
STATEMENT
STATION
STATUS
STAY
STEADY
STEAM
STEEL
STEER
STEP
STERILE
STERN
STILL
STOMACH
STOP
STOPPER
STORAGE
STORE
STORY
STOW
STOWAGE
STRAIGHT
STRAIN
STRAND
STRAP
STRATEGIC
STREAM
STRENGTH
STRETCHER
STRIKE
STRIKER
STRIPE
STRONG
STRUCK
STRUCTURAL
STUDY
STUFF
SUBJECT
SUBMARINE
SUBMERGE
SUBSEQUENT
SUBSTANCE
SUBSTITUTE
SUCCESSFUL
SUCH
SUCTION
SUFFICIENT
SUITABLE
SUMMARY
SUN
SUNSET
SUPERIOR
SUPERSTRUCTURE
SUPERVISE
SUPPLEMENTARY
SUPPLY
SUPPORT
SURE
SURFACE
SURGE
SURRENDER
SURVEY
SURVIVAL
SUSPEND
SWEEP
SWEEPER
SWING
SWITCH
SWIVEL
SYMBOL
SYMPTOM
SYNTHETIC
SYSTEM
TABLE
TACTIC
TACTICAL
TAG
TAKE
TAKEN
TALK
TALKER
TANK
TAPS
TARGET
TASK
TAUT
TAX
TEAM
TECHNICAL
TECHNIQUE
TEETH
TELEPHONE
TELL

TEMPERATURE
TEMPORARY
TEN
TEND
TENDER
TENSION
TERM
TEST
THAN
THAT
THE
THEIR
THEM
THEMSELVES
THEN
THERE
THEREFORE
THERMAL
THESE
THEY
THICK
THING
THINK
THIRD
THIS
THOROUGH
THOSE
THOUGH
THOUSAND
THREAD
THREE
THROAT
THROUGH
THROW
THUS
TIDE
TIE
TIGHT
TIME
TISSUE
TITLE
TO
TODAY
TOGETHER
TOLERANCE
TON
TOO
TOOL
TOP
TOPSIDE
TORPEDO
TOTAL
TOUCH
TOUR
TOURNIQUET
TOW
TOWARD
TOXIC
TRACK
TRAFFIC
TRAIN
TRANSFER
TRANSMISSION
TRANSPORT
TRASH
TRAVEL
TREAT
TREATMENT
TRIAL
TRIED
TRIGGER
TROOP
TROPICAL
TROUBLE
TROUSERS
TRUE
TRY
TUBE
TUG
TUITION
TURBINE
TURN
TWICE
TWIN
TWIST
TWO
TYPE
TYPICAL
UNABLE
UNAUTHORIZED
UNCOVER
UNDER
UNDERSTAND
UNDERWATER
UNIFORM
UNIT
UNITE
UNLESS
UNTIL
UP
UPON
UPPER
UPWARD
US
USE
USEFUL
USER
USUAL
VALUE
VALVE
VAPOR
VARIATION
VARIETY
VARIOUS
VARY
VEHICLE
VELOCITY
VENTILATE
VERSION
VERTICAL
VERY
VESSEL
VETERAN
VICE
VICINITY
VICTIM
VIEW
VIOLATION
VISIBILITY
VISIBLE
VISION
VISIT
VISITOR
VISUAL
VITAL
VOICE
VOMIT
WAIT
WALK
WANT
WAR
WARDROOM
WARFARE
WARM
WARNING
WARRANT
WARSHIP
WARTIME
WAS
WASH

WATCH
WATER
WATERLINE
WATERTIGHT
WAVE
WAY
WE
WEAK
WEAPON
WEAR
WEATHER
WEEK
WEIGHT
WELDING
WELL
WERE
WEST
WET
WHAT
WHATEVER
WHEEL
WHEN
WHENEVER
WHERE
WHEREAS
WHETHER
WHICH
WHILE
WHIP
WHISTLE
WHITE
WHO
WHOLE
WHOM
WHOSE
WHY
WIDE
WILL
WILLFUL
WINCH
WIND
WINDLASS
WING
WIRE
WITH
WITHDRAWAL
WITHIN
WITHOUT
WOMAN
WOMEN
WOOD
WOODEN
WORD
WORK
WORLD
WORN
WOULD
WOUND
WRIST
WRITTEN
WRONG
YARD
YEAR
YET
YOLK
YOU
YOUNG
YOUR
YOURSELF
ZEBRA
ZERO
ZONE

APPENDIX C

THE SUPPLEMENTARY TECHNICAL LISTS

This appendix contains the root-word forms of the three supplementary lists: electronics, propulsion engineering, and administrative-clerical. The sources of the words in the lists are shown after the three lists at the end of the appendix.

Words marked with an asterisk are also found on the Common Word List (appendix A).

ELECTRONICS LIST

AC
ACCUMULATION
ACCURATE*
ADJACENT
ALTERNATE*
ALTERNATION
ALTERNATOR
AMMETER
AMPERE*
AMPLIFICATION
AMPLIFIER*
AMPLITUDE*
ANODE
ANTENNA*
APPARENT
APPLIED
ARMATURE
ATOM*
ATTENUATE*
ATTENUATOR
AUDIO
AUDIOFREQUENCY
AVALANCHE
B-PLUS
BAND-PASS
BASE*
BATTERY*
BIAS*
BLEEDER
BRIDGE*
BRIGHTNESS*
BRUSH*
CALIBRATION
CANDLEPOWER
CAPACITANCE*
CAPACITIVE
CAPACITOR*
CATHODE*
CATHODE-RAY
CELL*
CHASSIS
CHIP*
CIRCUIT*
COAXIAL
COIL*
COLLECTOR
COMMUTATOR
CONDENSER*
CONDUCTANCE
CONDUCTIVE
CONDUCTIVITY
CONDUCTOR*
CONFIGURATION*
CONNECTOR
CONTINUITY
CONTRAST*
CONTROL*
CORE*
COSINE
COUPLE*
CRYSTAL*
CURRENT*
CURSOR
CUTOFF
CYCLE*
DC
DECIBEL*
DECIMAL*
DEENERGIZE*
DEMODULATOR
DETECTION*
DETECTOR
DIELECTRIC
DIODE*
DISCHARGE*
DISCRIMINATOR
DISPLAY*
DISTORTION*
ELECTRO-MAGNETIC
ELECTRODE*
ELECTROLYTIC
ELECTROMAGNET
ELECTROMAGNETIC
ELECTROMAGNETISM
ELECTROMOTIVE
ELECTRON*
ELECTROSTATIC
EMF
EMISSION
EMIT
EMITTER
EXPONENT
FARAD
FEEDBACK*
FIELD-EFFECT
FILAMENT
FILTER*
FLUORESCENT
FLUX
FREQUENCY*
FUSE
GAUGE*
GENERATOR*
GRID*
GROUND*
GYRO
HENRY
HERTZ
HYPOTENUSE
ILLUMINATE*
ILLUMINATION
IMPEDANCE*
INCANDESCENT
INDUCE*
INDUCTANCE
INDUCTIVE
INDUCTOR
INPHASE
INSULATION*
INSULATOR
INTEGRATE*
INTEGRATION
INTENSITY*
INTERFERENCE
INVERSE
JUNCTION*
LINEAR*
LOAD*
LOOP*
MAGNET*
MAGNETIZE
MEGOHM
METER*
MICROAMPERE
MICROFARAD
MICROMICROFARAD
MICROVOLT
MILLIAMMETER
MILLIAMPERE
MILLIMICROAMPERE
MILLIMICROFARAD
MILLIMICROVOLT
MILLIVOLT
MINIATURE
MODULE*
MOLECULE*
MULTIMETER
NANOAMPERE
NANOFARAD
NEGATIVE*

NEUTRAL*
NEUTRON
NONLINEAR
NUCLEUS
OHM*
OHMIC
OHMMETER
ORBIT
OSCILLATE
OSCILLATOR*
OSCILLOSCOPE
PARALLEL-CONNECT
PEAK-TO-PEAK
PENTODE
PHOTODIODE
PICOFARAD
PLATE*
POSITIVE*
POTENTIOMETER
PREAMPLIFIER
PRESET
PROBE
PROTON
RADARSCOPE
RADIATING
RADIOACTIVE*
RADIOACTIVITY
RADIOFREQUENCY
RADIUS*
RATIO*
REACTANCE*
REACTIVE
RECEPTACLE*
RECHARGE
RECHARGEABLE
RECIPROCAL
RECTIFICATION
RECTIFIER
RELAY*
REPEL
RESET*
RESISTANCE*
RESISTIVE
RESISTOR*
RESONANCE
RESONANT
RESULTANT
RHEOSTAT
RMS
ROOT-MEAN-SQUARE
ROTOR*
SATURATION
SCIENTIFIC
SCREEN*
SEMICONDUCTOR
SERIES*
SERIES-AIDING
SERIES-PARALLEL
SERVO*
SERVOMECHANISM
SERVOSYSTEM
SHORT-CIRCUITING
SIGNAL-TO-NOISE
SIMULATOR
SINE
SINE-WAVE
SOLENOID*
SOLID-STATE
SPECTRUM
STATOR*
SUBSYSTEM*
SUPPRESSOR
SWITCH*
TACH
TACHMOMETER
TANGENT
TAP*
TECHNICIAN*
TETRODE
THEORY*
THERMISTOR
THERMOCOUPLE
THREE-CONDUCTOR
TOLERANCE*
TRANSFORMER*
TRANSISTOR
TRANSIT
TRIODE
TUBE*
VACUUM-TUBE
VOLT*
VOLT-AMPERE
VOLTAGE*
VOLTMETER
WATT*
WATTAGE
WATTMETER
WAVEFORM
WAVELENGTH

PROPULSION ENGINEERING LIST

ABSORBTION
ACCUMULATOR
ADJUSTABLE
AFTERBURNER
AIR-COOLED
ALL-PURPOSE
ANNEAL*
ANTIFRICTION
APPLICATOR
ASBESTOS
AXIAL-FLOW
AXLE
BACK-PRESSURE
BAFFLE
BALL-PEEN
BAR*
BARREL*
BEARING*
BELT*
BEVEL
BIMETALLIC
BIT*
BLOCK*
BLOWER
BLUEPRINT*
BOLT*
BOX-END
BRISTOL
BRONZE*
BUCKLE*
BURNER
BUSHING
CALIBRATION
CAMLOC
CAMSHAFT
CARTRIDGE*
CASE*
CASING
CENTRIFUGAL*
CHAINFALL
CHAMBER*
CHECK*
CHISEL
CLEANER
CLUTCH*
COMBUSTION*
COMPRESSION*
COMPRESSOR*
CONICAL
CONSUMPTION
COOLANT
COOLER
COOLING*
COTTER
COUNTER*
COUNTERCLOCKWISE*
COUNTERSINK
COUNTERWEIGHT
COUPLING*
COVER*
COVERALL
CRANE
CRANK*
CYLINDER*
D-RING
DAMPER
DEAD-CENTER
DEFUELING
DEHUMIDIFICATION
DEISEL-DRIVEN
DIAGONAL*
DIAPHRAGM*
DIE*
DIFFERENTIAL*
DIFFUSER
DIRECT-DRIVEN
DISTANCE*
DRAINAGE
DRAWING*
DRILL*
DRIVEN*
DUPLEX
EDGE*
EJECTOR
ELECTROHYDRAULIC
ENERGY*
ENGINE*
EVAPORATION
EXHAUST*
EXTINGUISH*
FASTENER*
FEEDBACK*
FEELER
FILTER*
FIREFIGHTER
FIREFIGHTING*
FIREPROOF
FIRING*
FIT*
FIXED*
FLEXIBILITY
FLUCTUATE
FLYWHEEL
FOG-FOAM
FOOT-POUND
FORCE*
FREON
FRICTION*
FUEL*
FUME*
FUNNEL
GAGE*
GALVANIZE
GAS*
GAS-GENERATOR
GEAR*
GEAR-SHIFT
GOGGLES*
GYRO
HACKSAW
HAMMER*
HANDCRANK
HANDLE*
HANDWHEEL
HEAD*
HELICAL
HIGH-PRESSURE
HOIST*
HOSE*
HOUSING*
HYDRAULICAL
IDLER
IGNITE*
IGNITION*
IMPELLER
IMPULSE*
INCH*
INJECTION*
INJECTOR
INLET*
INTAKE*
JACK*
JET*
JOINT*
KEY*
KEYWAY
KINETIC
LABYRINTH
LATERAL
LEAKAGE*

LEVEL*
LEVER*
LIGHT-OFF
LINE*
LIQUID-PROPELLANT
LONG-NOSE
LONGITUDINAL
LUBRICANT*
MALLET
MANHOLE
MANIFOLD*
MANOMETER
MERCURY*
METALLIC
MICROMETER
NEEDLE*
NOZZLE*
OIL*
PASSAGE*
PETCOCK
PHILLIPS-HEAD
PIN*
PIPE*
PIVOT
PLIERS
PLUG*
POINT*
PORT*
POUND*
POWER*
PRESSURE*
PRIMARY*
PRIME*
PROPELLER*
PUMP*
PUNCH*
PURIFY*
RATCHET
RECHARGE
RETAIN*
RETHREADING
RING*
RISER
ROCKER
ROD*
ROTATE*
ROTOR*
SATURATION
SCREW*
SCREWDRIVER*
SECTION*
SELF-IGNITION
SELF-PRIMING
SET*
SETPOINT
SETSCREW
SHAFT*
SHEAR*
SLEEVE*
SLIDE*
SLIP-JOINT
SLUDGE
SOLENOID*
SPECIFICATION*
SPIRAL*
SPLASH-LUBRICATION
SPLINE
SPLIT-RING
SPRING*
SPROCKET
SPUR
STEM*
STRAINER
STROKE*
SUPERHEAT
SUPPLY*
SYSTEM*
TANK*
TAP*
TEMPERATURE*
THREAD*
THRUST*
TOOL*
TORQUE*
TORSION
TRAIN*
TURBINE*
TWO-VENTURI
U-JOINT
UNIT*
UNIVERSAL*
V-BELT
VACUUM*
VALVE*
VANE
VENTURI
VISE-GRIP
WALL*
WASHER
WATER-COOLED
WATER-PUMP
WELDING*
WHEEL*
WIRE*
WORK*
WRENCH*
YOKE

ADMINISTRATIVE-CLERICAL LIST

ABBREVIATION*
ABSENCE*
ABSENT*
ACCESSIBLE
ACCOMPANY
ACCOMPLISHMENT
ACCOUNT*
ACCOUNTABILITY
ACCUMULATION
ACHIEVE
ACTIVITY*
ADAPT*
ADAPTATION
ADD*
ADDRESSEE
ADHERENCE
ADMIN
ADMINISTRATION*
ADMINISTRATIVE*
AFFIX
AFLOAT*
AIR*
ALPHABET*
ALPHABETICAL
ANALYSIS*
ANNUAL
APPLICABLE*
APPROPRIATION
ARRANGEMENT*
AUDIT*
AUDITOR
AUTHORIZATION
AUTOMATE
BACK*
BOTTOM*
BOX*
CALCULATION
CALL*
CARBON*
CARD*
CHAIN*
CLASSIFICATION*
CLEAN*
CODE*
COMMAND*
COMMUNICATION*
COMPLIANCE
CONFIDENTIAL
CONSECUTIVE*
CONSUMABLE

COPY*
CORRECTION*
COVER*
CUSTODIAN
DEFINITION
DELEGATE
DELETE*
DELETION
DEPARTURE
DEPLOY
DEPLOYMENT
DIAL*
DIRECTIVE
DIRECTORY*
DISAPPROVE
DISCRIMINATION
DOCUMENT*
DOCUMENTATION
DOWNGRADE
DUPLICATE
ELECTRONIC*
ENCLOSE
ERASER
EVALUATION*
FEEDBACK*
FEEDER
FILE*
FINISH*
FLUID*
FOLDER
FRAME*
FUND
HYPHENATE
INCORPORATE*
INDENT
LETTERHEAD
LINE*
LISTING
LOCAL*
MACHINE*
MAIL*
MANUAL*
MARGIN*
MEMORANDUM
NOMENCLATURE
NUMBER*
NUMERAL*
NUMERICAL*
OBJECTIVE
OFFICE*

OPERATOR*
ORDER*
ORGANIZATIONAL
ORIGINATE
ORIGINATOR
OUTSTANDING*
PAPER*
PENCIL*
PENDING
PERCENT*
PERCENTAGE*
POLITE
PRESERVATION*
PROFESSION
PROFESSIONAL*
PROFESSIONALISM
QUALIFICATION*
QUOTA
READINESS*
RECIPIENT
RECORDKEEPING
RECURE
RELIABLE*
REPRODUCTION
RESPONSIBILITY*
RETENTION
REUSABLE
ROUTE*
SAFEGUARD
SECRET*
SECURITY*
SERIAL*
SIGN*
SIGNIFICANCE
SPACE*
SPOOL
STAFF*
STANDARDIZE
STAPLE
STAPLER
STATION*
STATIONERY
STENCIL
SUBJ
SUBJECT*
SUBMISSION
SUBORDINATE
SUBSYSTEM*
SUPERVISOR*
SUPERVISORY

SUPPLY*
SURVEY*
SURVEYOR
SYMBOL*
TABLE*
TELEPHONE*
TEXT*
TISSUE*
TONE*
TYPE*
TYPEWRITER
TYPIST
UNAUTHORIZED*
UNCLASSIFIED
UNSATISFACTORY*
URGENT
UTILIZATION
VERSUS
VIA

SOURCES CONTRIBUTING TO THE SUPPLEMENTARY TECHNICAL LISTS AND THE LIST CONTRIBUTED TO

1. NAVSEA MANUAL S9086 PUBLISHED BY NAVAL SEA SYSTEMS COMMAND

ELECTRONICS LIST.

Electronics. NAVSEA S9086-ND-STM-000/CH 400. 1 June 1976. Change, 1 November 1977.

Lighting. NAVSEA S9086-K9-STM-000/CH 330. 1 June 1977. Change, 15 May 1979.

PROPULSION ENGINEERING LIST.

Practical Damage Control. MAVSEA S9086-CN-STM-020/CH 079. 1 July 1977. Change, 30 April 1979.

Storage, Handling and Disposal of Hazardous General Use Consumables. NAVSEA S9086-WK-STM-000/CH 670. 1 February 1976. Change, 1 August 1978.

ADMINISTRATIVE-CLERICAL LIST.

Administration of Funds. NAVSEA S9086-BH-STM-000/CH 041. 1 March 1976. Change, 1 November 1977.

Inspections, Tests, Records, and Reports. NAVSEA S9086-CZ-STM-000/CH 090. 15 February 1977. Change, 15 December 1977.

2. RATE TRAINING MANUAL GLOSSARIES

ELECTRONICS LIST.

Aviation Fire Control Technician 3 & 2. NAVEDTRA 10387-B. 1977. Naval Education and Training Command.

Electronics Technician 3 & 2, Vol. 2. NAVEDTRA 10195-A. 1974. Naval Education and Training Command.

Gunner's Mate M 3 & 2. NAVEDTRA 10199-C. 1977. Naval Education and Training Command.

Basic Electricity. NAVPERS 10086-B. 1970. Bureau of Naval Personnel.

PROPULSION ENGINEERING LIST.

Machinist's Mate 3 & 2. NAVEDTRA 10524-E. 1978. Naval Education and Training Command.

SOURCES CONTRIBUTING TO THE SUPPLEMENTARY TECHNICAL LISTS AND THE LIST CONTRIBUTED TO (continuted)

ADMINISTRATIVE-CLERICAL LIST.

Yeoman 3 & 2. NAVEDTRA 10240-G. 1976. Naval Education and Training Command.

3. DEFENSE LANGUAGE INSTITUTE WORD LISTS

ELECTRONICS LIST.

Basic Electronics Terminology. Student Text. Volumes 5000-I,II,III. 1967. American Language Course. (For the Basic Electronics Occupational Category.)

PROPULSION ENGINEERING LIST.

Terminology of Maintenance and Mechanics. Student Text. Volumes 6100-I,II,III. October 1975. American Language Course. (For the Maintenance and Mechanics Occupational Category.)

CLERICAL AND ADMINISTRATIVE LIST.

Clerical and Administrative Terminology. Student Text. Volumes 6200-I,II,III. September 1975. American Language Course. (For the Clerical and Administrative Occupational Category.)

APPENDIX D

THE ARMY WORD SUBSTITUTION LIST WITH GRAMMATICAL VARIATIONS

This list resulted from expanding the 183 original words, with their substitutes, of the Army Word Substitution List, words originally found in Cir. 310-9, Headquarters Department of the Army. The expanded Army Word Substitution List contains 725 different word-substitute forms. This is the form of the Army List that was actually used in the computer readability editing system.

ACCOMPANIED	WENT WITH	
ACCOMPANIES	GOES WITH	
ACCOMPANY	GO WITH	
ACCOMPANYING	GOING WITH	
ACCOMPLISH	CARRY OUT	DO
ACCOMPLISHABLE	DOABLE	
ACCOMPLISHED	CARRIED OUT	DID/DONE
ACCOMPLISHES	CARRIES OUT	DOES
ACCOMPLISHING	CARRYING OUT	DOING
ACCORDINGLY	SO	
ACCRUAL	ADDITION	GAIN
ACCRUALS	ADDITIONS	GAINS
ACCRUE	ADD	GAIN
ACCRUED	ADDED	GAINED
ACCRUEMENT	ADDITION	GAIN
ACCRUES	ADDS	GAINS
ACCRUING	ADDING	GAINING
ACCURACY	CORRECTNESS	EXACTNESS
ACCURATE	CORRECT	EXACT
ACCURATELY	CORRECTLY	EXACTLY
ACHIEVABLE	DOABLE	MAKABLE
ACHIEVE	DO	MAKE
ACHIEVED	DID	MADE
ACHIEVES	DOES	MAKES
ACHIEVING	DOING	MAKING
ACTUAL	REAL	
ACTUALLY	REALLY	
ADDITIONAL	ADDED	MORE
ADVANTAGEOUS	HELPFUL	
ADVANTAGEOUSLY	HELPFULLY	
ADVISABLE	RECOMMENDABLE	
ADVISE	RECOMMEND	TELL
ADVISED	RECOMMENDED	TOLD
ADVISES	RECOMMENDS	TELLS
ADVISING	RECOMMENDING	TELLING
AFFIX	PUT	STICK
AFFIXED	PUT	STUCK
AFFIXES	PUTS	STICKS
AFFIXING	PUTTING	STICKING
AIRCRAFT	PLANE/PLANES	
AIRCRAFT'S	PLANE'S	
AIRCRAFTS'	PLANES'	
ANTICIPATABLE	EXPECTABLE	
ANTICIPATE	EXPECT	
ANTICIPATED	EXPECTED	
ANTICIPATES	EXPECTS	
ANTICIPATING	EXPECTING	
ANTICIPATION	EXPECTATION	
APPARENT	CLEAR	PLAIN
APPARENTLY	CLEARLY	PLAINLY
APPEAR	SEEM	
APPEARED	SEEMED	

APPEARING	SEEMING	
APPEARS	SEEMS	
APPRECIABLE	MANY	
APPROPRIATE	PROPER	RIGHT
APPROPRIATELY	PROPERLY	RIGHTLY
APPROXIMATELY	ABOUT	
ASCERTAIN	FIND OUT	LEARN
ASCERTAINED	FOUND OUT	LEARNED
ASCERTAINING	FINDING OUT	LEARNING
ASCERTAINS	FINDS OUT	LEARNS
ASSIST	AID	HELP
ASSISTANCE	AID	HELP
ASSISTED	AIDED	HELPED
ASSISTING	AIDING	HELPING
ASSISTS	AIDS	HELPS
ATTEMPT	TRY	
ATTEMPTED	TRIED	
ATTEMPTING	TRYING	
ATTEMPTS	TRIES	
BENEFICIAL	HELPFUL	
BENEFICIARIES	PERSONS HELPED	
BENEFICIARY	PERSON HELPED	
BENEFIT	HELP	AM/ARE HELPED
BENEFITED	HELPED	WAS HELPED
BENEFITER	HELPER	
BENEFITERS	HELPERS	
BENEFITING	HELPING	BEING HELPED
BENEFITS	HELPS	IS HELPED
BENEFITTED	HELPED	WAS HELPED
BENEFITTING	HELPING	BEING HELPED
CAPABILITIES	ABILITIES	
CAPABILITIES'	ABILITIES'	
CAPABILITY	ABILITY	
CAPABILITY'S	ABILITY'S	
CATEGORIES	CLASSES	GROUPS
CATEGORIES'	CLASSES'	GROUPS'
CATEGORIZE	CLASS	GROUP
CATEGORIZED	CLASSED	GROUPED
CATEGORIZES	CLASSES	GROUPS
CATEGORIZING	CLASSING	GROUPING
CATEGORY	CLASS	GROUP
CATEGORY'S	CLASS'S	GROUP'S
COMBINE	JOIN	
COMBINED	JOINED	
COMBINES	JOINS	
COMBINING	JOINING	
COMPLIED	FOLLOWED	
COMPLIER	FOLLOWER	
COMPLIERS	FOLLOWERS	
COMPLIES	FOLLOWS	
COMPLY	FOLLOW	
COMPLYING	FOLLOWING	

COMPONENT	PART	
COMPONENT'S	PART'S	
COMPONENTS	PARTS	
COMPONENTS'	PARTS'	
COMPRISE	FORM	INCLUDE
COMPRISED	FORMED	INCLUDED
COMPRISES	FORMS	INCLUDES
COMPRISING	FORMING	INCLUDING
CONCERNING	ABOUT	ON
CONCLUDE	CLOSE	END
CONCLUDED	CLOSED	ENDED
CONCLUDES	CLOSES	ENDS
CONCLUDING	CLOSING	ENDING
CONCLUSION	CLOSE	END
CONCUR	AGREE	
CONCURRED	AGREED	
CONCURRENCE	AGREEMENT	
CONCURRING	AGREEING	
CONCURS	AGREES	
CONFRONT	FACE	MEET
CONFRONTATION	MEETING	
CONFRONTATIONS	MEETINGS	
CONFRONTED	FACED	MET
CONFRONTING	FACING	MEETING
CONFRONTS	FACES	MEETS
CONSEQUENTLY	SO	
CONSOLIDATE	COMBINE	JOIN
CONSOLIDATED	COMBINED	JOINED
CONSOLIDATES	COMBINES	JOINS
CONSOLIDATING	COMBINING	JOINING
CONSOLIDATION	COMBINATION	MERGER
CONSOLIDATOR	COMBINER	MERGER
CONSOLIDATORS	COMBINERS	MERGERS
CONSTITUTE	BE	FORM
CONSTITUTED	WAS	FORMED
CONSTITUTES	IS	FORMS
CONSTITUTING	BEING	FORMING
CONSTITUTION	FORM	MAKE-UP
CONSTRUCT	BUILD	
CONSTRUCTED	BUILT	
CONSTRUCTING	BUILDING	
CONSTRUCTOR	BUILDER	
CONSTRUCTS	BUILDS	
CONTAIN	HAVE	
CONTAINED	HAD	
CONTAINING	HAVING	
CONTAINS	HAS	
CONTINUE	KEEP ON	
CONTINUED	KEPT ON	
CONTINUES	KEEPS ON	
CONTINUING	KEEPING ON	
CONTRIBUTE	GIVE	

CONTRIBUTED	GAVE	
CONTRIBUTES	GIVES	
CONTRIBUTING	GIVING	
CONTRIBUTION	GIFT	
CONTRIBUTIONS	GIFTS	
CONTRIBUTIVELY	GIVINGLY	
CONTRIBUTOR	GIVER	
CONTRIBUTORS	GIVERS	
CONTRIBUTORY	GIVING	
COOPERATE	HELP	
COOPERATED	HELPED	
COOPERATES	HELPS	
COOPERATING	HELPING	
COOPERATIVE	HELPFUL	
COOPERATOR	HELPER	
COOPERATORS	HELPERS	
DEEM	THINK	
DEEMED	THOUGHT	
DEEMING	THINKING	
DEEMS	THINKS	
DELETE	CUT	DROP
DELETED	CUT	DROPPED
DELETES	CUTS	DROPS
DELETING	CUTTING	DROPPING
DELETION	CUTTING	DROPPING
DEMONSTRABLE	PROVABLE	
DEMONSTRATE	PROVE	SHOW
DEMONSTRATED	PROVED	SHOWED
DEMONSTRATES	PROVES	SHOWS
DEMONSTRATING	PROVING	SHOWING
DEPART	LEAVE	
DEPARTED	LEFT	
DEPARTING	LEAVING	
DEPARTS	LEAVES	
DESIGNATE	APPOINT	CHOOSE
DESIGNATED	APPOINTED	CHOSE/CHOSEN
DESIGNATES	APPOINTS	CHOOSES
DESIGNATING	APPOINTING	CHOOSING
DESIRE	WISH	
DESIRED	WISHED	
DESIRES	WISHES	
DESIRING	WISHING	
DESIROUSLY	WISHFULLY	
DESIROUSNESS	WISHFULNESS	
DETERMINABLE	DECIDABLE	FIGURABLE
DETERMINE	DECIDE	FIGURE
DETERMINED	DECIDED	FIGURED
DETERMINES	DECIDES	FIGURES
DETERMINING	DECIDING	FIGURING
DEVELOP	GROW	MAKE
DEVELOPED	GREW/GROWN	MADE
DEVELOPING	GROWING	MAKING

DEVELOPS	GROWS	MAKES
DISCLOSE	SHOW	
DISCLOSED	SHOWN	SHOWED
DISCLOSES	SHOWS	
DISCLOSING	SHOWING	
DISCONTINUANCE	DROPPING	STOPPING
DISCONTINUATION	DROPPING	STOPPING
DISCONTINUE	DROP	STOP
DISCONTINUED	DROPPED	STOPPED
DISCONTINUES	DROPS	STOPS
DISCONTINUING	DROPPING	STOPPING
DISSEMINATE	ISSUE	SEND OUT
DISSEMINATED	ISSUED	SENT OUT
DISSEMINATES	ISSUES	SENDS OUT
DISSEMINATING	ISSUING	SENDING OUT
DISSEMINATION	ISSUANCE	SENDING OUT
DISSEMINATOR	ISSUER	
DISSEMINATORS	ISSUERS	
ECHELON	LEVEL	
ECHELON'S	LEVEL'S	
ECHELONS	LEVELS	
ECHELONS'	LEVELS'	
EFFECTED	MADE	
EFFECTING	MAKING	
ELECT	CHOOSE	PICK
ELECTED	CHOSE/CHOSEN	PICKED
ELECTING	CHOOSING	PICKING
ELECTS	CHOOSES	PICKS
ELIMINATE	CUT	DROP
ELIMINATED	CUT	DROPPED
ELIMINATES	CUTS	DROPS
ELIMINATING	CUTTING	DROPPING
ELIMINATION	CUTTING	DROPPING
EMPLOY	USE	
EMPLOYED	USED	
EMPLOYING	USING	
EMPLOYMENT	USE	
EMPLOYMENTS	USES	
EMPLOYS	USES	
ENCOUNTER	MEET	
ENCOUNTERED	MET	
ENCOUNTERING	MEETING	
ENCOUNTERS	MEETS	
ENCOURAGE	URGE	
ENCOURAGED	URGED	
ENCOURAGES	URGES	
ENCOURAGING	URGING	
ENDEAVOR	TRY	
ENDEAVORED	TRIED	
ENDEAVORING	TRYING	
ENDEAVORS	TRIES	
ENSURE	MAKE SURE	

ENSURED	MADE SURE	
ENSURES	MAKES SURE	
ENSURING	MAKING SURE	
ENUMERATE	COUNT	
ENUMERATED	COUNTED	
ENUMERATES	COUNTS	
ENUMERATING	COUNTING	
ENUMERATION	COUNT	
ENUMERATIONS	COUNTS	
ENUMERATOR	COUNTER	
ENUMERATORS	COUNTERS	
EQUITABLE	FAIR	
EQUITABLY	FAIRLY	
EQUIVALENT	EQUAL	
EQUIVALENTLY	EQUALLY	
ESTABLISH	SET UP	PROVE
ESTABLISHED	SET UP	PROVED
ESTABLISHES	SETS UP	PROVES
ESTABLISHING	SETTING UP	PROVING
EVALUATE	CHECK	RATE
EVALUATED	CHECKED	RATED
EVALUATES	CHECKS	RATES
EVALUATING	CHECKING	RATING
EVALUATION	CHECK	RATING
EVALUATIONS	CHECKS	RATINGS
EVALUATOR	CHECKER	RATER
EVALUATORS	CHECKERS	RATERS
EVIDENCED	SHOWED	
EVIDENCES	SHOWS	
EVIDENCING	SHOWING	
EVIDENT	CLEAR	
EXAMINATION	CHECK	CHECKING
EXAMINATIONS	CHECKS	
EXAMINE	CHECK	LOOK AT
EXAMINED	CHECKED	LOOKED AT
EXAMINES	CHECKS	LOOKS AT
EXAMINING	CHECKING	LOOKING AT
EXHIBIT	SHOW	
EXHIBITED	SHOWED	SHOWN
EXHIBITING	SHOWING	
EXHIBITION	SHOW	SHOWING
EXHIBITIONS	SHOWS	SHOWINGS
EXHIBITS	SHOWS	
EXPEDITE	HURRY	RUSH
EXPEDITED	HURRIED	RUSHED
EXPEDITES	HURRIES	RUSHES
EXPEDITING	HURRYING	RUSHING
EXPEDITIOUS	FAST	QUICK
EXPEDITIOUSLY	QUICKLY	
EXPEND	PAY OUT	SPEND
EXPENDED	PAID OUT	SPENT
EXPENDING	PAYING OUT	SPENDING

EXPENDS	PAYS OUT	SPENDS
EXPENSE	COST	FEE
EXPLAIN	SHOW	TELL
EXPLAINED	SHOWED	TOLD
EXPLAINING	SHOWING	TELLING
EXPLAINS	SHOWS	TELLS
FACILITATE	EASE	HELP
FACILITATED	EASED	HELPED
FACILITATES	EASES	HELPS
FACILITATING	EASING	HELPING
FACILITATION	HELP	HELPING
FACTOR	REASON	CAUSE
FACTOR'S	REASON'S	CAUSE'S
FACTORS	REASONS	CAUSES
FACTORS'	REASONS'	CAUSES'
FEASIBLE	CAN BE DONE	
FEMALE	WOMAN	
FEMALE'S	WOMAN'S	
FEMALES	WOMEN	
FEMALES'	WOMEN'S	
FINAL	LAST	
FINALIZATION	COMPLETION	FINISH
FINALIZATIONS	COMPLETIONS	FINISHINGS
FINALIZE	COMPLETE	FINISH
FINALIZED	COMPLETED	FINISHED
FINALIZES	COMPLETES	FINISHES
FINALIZING	COMPLETING	FINISHING
FORFEIT	GIVE UP	LOSE
FORFEITED	GAVE UP	LOST
FORFEITING	GIVING UP	LOSING
FORFEITS	GIVES UP	LOSES
FORFEITURE	GIVING UP	LOSS
FORFEITURES	LOSINGS	LOSSES
FORWARD	SEND	
FORWARDED	SENT	
FORWARDER	SENDER	
FORWARDERS	SENDERS	
FORWARDING	SENDING	
FORWARDS	SENDS	
FUNCTION	ACT	ROLE
FUNCTIONED	ACTED	WORKED
FUNCTIONING	ACTING	WORKING
FUNCTIONS	ACTS	WORKS
FUNDAMENTAL	BASIC	
FUNDAMENTALLY	BASICALLY	
FURNISH	GIVE	SEND
FURNISHED	GAVE/GIVEN	SENT
FURNISHER	GIVER	SENDER
FURNISHERS	GIVERS	SENDERS
FURNISHES	GIVES	SENDS
FURNISHING	GIVING	SENDING
HEREIN	HERE	

HOWEVER	BUT	
IDENTICAL	SAME	
IDENTICALNESS	SAMENESS	
IDENTIFIED	FOUND	NAMED
IDENTIFIER	FINDER	
IDENTIFIES	FINDS	NAMES
IDENTIFY	FIND	NAME
IDENTIFYING	FINDING	NAMING
IMMEDIATELY	AT ONCE	
IMPACTED	CHANGED	HIT
IMPACTING	CHANGING	HITTING
IMPACTION	CHANGE	HITTING
IMPACTS	CHANGES	HITS
IMPLEMENT	CARRY OUT	DO
IMPLEMENTATION	CARRYING OUT	DOING
IMPLEMENTED	CARRIED OUT	DID
IMPLEMENTING	CARRYING OUT	DOING
IMPLEMENTS	CARRIES OUT	DOES
INCEPTION	START	
INCEPTION'S	START'S	
INCEPTIONS	STARTS	
INCEPTIONS'	STARTS'	
INCORPORATE	BLEND	JOIN
INCORPORATED	BLENDED	JOINED
INCORPORATES	BLENDS	JOINS
INCORPORATING	BLENDING	JOINING
INDICATE	SHOW	WRITE DOWN
INDICATED	SHOWED/SHOWN	WRITEN DOWN
INDICATES	SHOWS	WRITES DOWN
INDICATING	SHOWING	WRITING DOWN
INDICATION	SIGN	
INDICATION'S	SIGN'S	
INDICATIONS	SIGNS	
INDICATIONS'	SIGNS'	
INITIAL	FIRST	
INITIALIZATIONS	STARTS	
INITIALIZE	START	
INITIALLY	AT FIRST	
INITIATE	START	
INITIATED	STARTED	
INITIATES	STARTS	
INITIATING	STARTING	
JUSTIFIED	PROVED/PROVEN	
JUSTIFIES	PROVES	
JUSTIFY	PROVE	
JUSTIFYING	PROVING	
LEGISLATION	LAW	LAWS
LEGISLATION'S	LAW'S	LAWS'
LIMITATION	LIMIT	
LIMITATION'S	LIMIT'S	
LIMITATIONS	LIMITS	
LIMITATIONS'	LIMITS'	

LOCATABLE	FINDABLE	
LOCATE	FIND	
LOCATED	FOUND	
LOCATES	FINDS	
LOCATING	FINDING	
LOCATION	PLACE	
LOCATION'S	PLACE'S	
LOCATIONS	PLACES	
LOCATIONS'	PLACES'	
MAGNITUDE	SIZE	
MAINTAIN	KEEP	SUPPORT
MAINTAINED	KEPT	SUPPORTED
MAINTAINING	KEEPING	SUPPORTING
MAINTAINS	KEEPS	SUPPORTS
MAJORITY	MOST	
MAXIMUM	GREATEST	LONGEST
MINIMIZATION	DECREASE	REDUCTION
MINIMIZATIONS	DECREASES	REDUCTIONS
MINIMIZE	DECREASE	LESSEN
MINIMIZED	DECREASED	LESSENED
MINIMIZES	DECREASES	LESSENS
MINIMIZING	DECREASING	LESSENING
MODIFIABILITY	CHANGEABILITY	
MODIFIABLE	CHANGEABLE	
MODIFICATION	CHANGE	
MODIFICATIONS	CHANGES	
MODIFIED	CHANGED	
MODIFIES	CHANGES	
MODIFY	CHANGE	
MODIFYING	CHANGING	
MONITOR	CHECK	WATCH
MONITORED	CHECKED	WATCHED
MONITORING	CHECKING	WATCHING
MONITORS	CHECKS	WATCHES
NEBULOUS	VAGUE	
NEBULOUSLY	VAGUELY	
NECESSITATE	CAUSE	NEED
NECESSITATED	CAUSED	NEEDED
NECESSITATES	CAUSES	NEEDS
NECESSITATING	CAUSING	NEEDING
NECESSITATION	CAUSE	NEED
NECESSITATIONS	CAUSES	NEEDS
NOTIFIED	LET---KNOW	TOLD
NOTIFIES	LETS---KNOW	TELLS
NOTIFY	LET---KNOW	TELL
NOTIFYING	LETTING---KNOW	TELLING
NUMEROUS	MANY	MOST
OBJECTIVE	AIM	GOAL
OBJECTIVE'S	AIM'S	GOAL'S
OBJECTIVES	AIMS	GOALS
OBJECTIVES'	AIMS'	GOALS'
OBLIGATE	BIND	COMPEL

OBLIGATED	BOUND	COMPELLED
OBLIGATES	BINDS	COMPELS
OBLIGATING	BINDING	COMPELLING
OBSERVE	SEE	
OBSERVED	SAW	SEEN
OBSERVES	SEES	
OBSERVING	SEEING	
OBTAIN	GET	
OBTAINED	GOT/GOTTEN	
OBTAINING	GETTING	
OBTAINS	GETS	
OPERATE	RUN	WORK
OPERATED	RAN/RUN	WORKED
OPERATES	RUNS	WORKS
OPERATING	RUNNING	WORKING
OPERATIONAL	WORKING	
OPTIMUM	BEST	GREATEST
OPTION	CHOICE	WAY
OPTION'S	CHOICE'S	WAY'S
OPTIONS	CHOICES	WAYS
OPTIONS'	CHOICES'	WAYS'
PARTICIPATE	TAKE PART	
PARTICIPATED	TOOK PART	TAKEN PART
PARTICIPATES	TAKES PART	
PARTICIPATING	TAKING PART	
PARTICIPATION	TAKING PART	
PERFORM	DO	
PERFORMED	DID/DONE	
PERFORMING	DOING	
PERFORMS	DOES	
PERMIT	LET	
PERMITS	LETS	
PERMITTED	LET	
PERMITTING	LETTING	
PERSONNEL	PEOPLE	STAFF
PLACE	PUT	
PLACED	PUT	
PLACES	PUTS	
PLACING	PUTTING	
PORTION	PART	
PORTION'S	PART'S	
PORTIONS	PARTS	
PORTIONS'	PARTS'	
POSITION	PLACE	
POSITIONED	PLACED	
POSITIONING	PLACING	
POSITIONS	PLACES	
POSSESS	HAVE	OWN
POSSESSED	HAD	OWNED
POSSESSES	HAS	OWNS
POSSESSING	HAVING	OWNING
PRECLUDE	PREVENT	

PRECLUDED	PREVENTED	
PRECLUDES	PREVENTS	
PRECLUDING	PREVENTING	
PREPARATION	READINESS	
PREPARE	GET READY	READY
PREPARED	READY	READIED
PREPAREDLY	READILY	
PREPAREDNESS	READINESS	
PREPARES	READIES	
PREPARING	GETTING READY	
PREVIOUS	EARLIER	PAST
PREVIOUSLY	BEFORE	
PRIORIZATION	RANKING	
PRIORIZATIONS	RANKINGS	
PRIORIZE	RANK	
PRIORIZED	RANKED	
PRIORIZES	RANKS	
PRIORIZING	RANKING	
PROBABILITIES	CHANCES	
PROBABILITIES'	CHANCES'	
PROBABILITY	CHANCE	
PROBABILITY'S	CHANCE'S	
PROCEDURE	RULE	WAY
PROCEDURE'S	RULE'S	WAY'S
PROCEDURES	RULES	WAYS
PROCEDURES'	RULES'	WAYS'
PROCEED	DO	GO ON
PROCEEDED	DID/DONE	WENT/GONE ON
PROCEEDING	DOING	GOING ON
PROCEEDS	DOES	GOES ON
PROFICIENCIES	SKILLS	
PROFICIENCIES'	SKILLS'	
PROFICIENCY	SKILL	
PROFICIENCY'S	SKILL'S	
PROGRAMED	PLANNED	
PROGRAMING	PLANNING	
PROGRAMMED	PLANNED	
PROGRAMMING	PLANNING	
PROGRAMS	PLANS	
PROMULGATE	ANNOUNCE	ISSUE
PROMULGATED	ANNOUNCED	ISSUED
PROMULGATES	ANNOUNCES	ISSUES
PROMULGATING	ANNOUNCING	ISSUING
PROMULGATION	ANNOUNCEMENT	
PROMULGATIONS	ANNOUNCEMENTS	
PROVIDE	GIVE	SAY
PROVIDED	GAVE/GIVEN	SAID
PROVIDES	GIVES	SAYS
PROVIDING	GIVING	SAYING
PURCHASE	BUY	
PURCHASED	BOUGHT	
PURCHASER	BUYER	

PURCHASERS	BUYERS	
PURCHASES	BUYS	
PURCHASING	BUYING	
RECAPITULATE	SUM UP	
RECAPITULATED	SUMMED UP	
RECAPITULATES	SUMS UP	
RECAPITULATING	SUMMING UP	
RECAPITULATION	SUMMING UP	
REDUCE	CUT	
REDUCED	CUT	
REDUCES	CUTS	
REDUCING	CUTTING	
REDUCTION	CUT	
REDUCTIONS	CUTS	
REFLECT	SAY	SHOW
REFLECTED	SAID	SHOWED
REFLECTING	SAYING	SHOWING
REFLECTS	SAYS	SHOWS
REGARDING	ABOUT	OF
RELOCATE	MOVE	
RELOCATED	MOVED	
RELOCATES	MOVES	
RELOCATING	MOVING	
RELOCATION	MOVE	
RELOCATION'S	MOVE'S	
RELOCATIONS	MOVES	
RELOCATIONS'	MOVES'	
REMAIN	STAY	
REMAINDER	REST	
REMAINDER'S	REST'S	
REMAINED	STAYED	
REMAINES	STAYS	
REMAINING	STAYING	
REMUNERATE	PAY	
REMUNERATED	PAID	
REMUNERATES	PAYS	
REMUNERATING	PAYING	
REMUNERATION	PAY	
REMUNERATION'S	PAY'S	
REMUNERATIONS	PAYMENTS	
REMUNERATIONS'	PAYMENTS'	
RENDER	GIVE	MAKE
RENDERABLE	GIVABLE	MAKABLE
RENDERED	GAVE/GIVEN	MADE
RENDERER	GIVER	MAKER
RENDERING	GIVING	MAKING
RENDERS	GIVES	MAKES
REQUEST	ASK	
REQUESTED	ASKED	
REQUESTING	ASKING	
REQUESTS	ASKS	
REQUIRE	MUST	NEED

REQUIRED	NEEDED	
REQUIREMENT	NEED	
REQUIREMENT'S	NEED'S	
REQUIREMENTS	NEEDS	
REQUIRES	NEEDS	
REQUIRING	NEEDING	
RETAIN	KEEP	
RETAINED	KEPT	
RETAINING	KEEPING	
RETAINS	KEEPS	
RETENTION	KEEPING	
RETURN	GO BACK	
RETURNED	WENT BACK	GONE BACK
RETURNEE	ONE WHO GOES BACK	
RETURNEES	THOSE WHO COME BACK	
RETURNER	ONE WHO TAKES BACK	
RETURNERS	THOSE WHO TAKE BACK	
RETURNING	GOING BACK	
RETURNS	GOES BACK	
REVIEW	CHECK	GO OVER
REVIEWED	CHECKED	WENT/GONE OVER
REVIEWING	CHECKING	GOING OVER
REVIEWS	CHECKS	GOES OVER
SELECT	CHOOSE	
SELECTED	CHOSE/CHOSEN	
SELECTING	CHOOSING	
SELECTION	CHOICE	
SELECTION'S	CHOICE'S	
SELECTIONS	CHOICES	
SELECTIONS'	CHOICES'	
SELECTS	CHOOSES	
SIMILAR	LIKE	
SIMILARITY	LIKENESS	
SOLICIT	ASK FOR	
SOLICITED	ASKED FOR	
SOLICITING	ASKING FOR	
SOLICITS	ASKS FOR	
STATE	SAY	
STATED	SAID	
STATES	SAYS	
STATING	SAYING	
SUBMIT	GIVE	SEND
SUBMITS	GIVES	SENDS
SUBMITTED	GAVE/GIVEN	SENT
SUBMITTER	GIVER	SENDER
SUBMITTERS	GIVERS	SENDERS
SUBMITTING	GIVING	SENDING
SUBSEQUENT	LATER	NEXT
SUBSEQUENTLY	AFTER	LATER
SUBSTANTIAL	LARGE	REAL
SUFFICIENT	ENOUGH	
TERMINATE	END	STOP

TERMINATED	ENDED	STOPPED
TERMINATES	ENDS	STOPS
TERMINATING	ENDING	STOPPING
TERMINATION	ENDING	
TERMINATIONS	ENDINGS	
THEREFORE	SO	
THEREOF	ITS	THEIR
TRANSMIT	SEND	
TRANSMITS	SENDS	
TRANSMITTABLE	SENDABLE	
TRANSMITTED	SENT	
TRANSMITTING	SENDING	
TRANSPIRATION	HAPPENING	OCCURRENCE
TRANSPIRATIONS	HAPPENINGS	OCCURRENCES
TRANSPIRE	HAPPEN	OCCUR
TRANSPIRED	HAPPENED	OCCURRED
TRANSPIRES	HAPPENS	OCCURS
TRANSPIRING	HAPPENING	OCCURRING
UTILIZABILITIES	USES	
UTILIZABILITY	USABILITY	USEFULNESS
UTILIZABLE	USABLE	USEFUL
UTILIZATION	USE	
UTILIZATIONS	USES	
UTILIZE	USE	
UTILIZED	USED	
UTILIZER	USER	
UTILIZERS	USERS	
UTILIZES	USES	
UTILIZING	USING	
VALIDATE	CONFIRM	
VALIDATED	CONFIRMED	
VALIDATES	CONFIRMS	
VALIDATING	CONFIRMING	
VALIDATION	CONFIRMATION	
VALIDATIONS	CONFIRMATIONS	
VALUE	COST	WORTH
VERBATIM	WORD FOR WORD	EXACT
VIA	IN	ON
VIABLE	WORKABLE	
WARRANT	CALL FOR	PERMIT
WARRANTED	CALLED FOR	PERMITTED
WARRANTING	CALLING FOR	PERMITTING
WARRANTS	CALLS FOR	PERMITS
WHENEVER	WHEN	
WHEREAS	SINCE	
WITNESS	SEE	
WITNESSED	SAW	SEEN
WITNESSES	SEES	
WITNESSING	SEEING	

APPENDIX E

THE NAVY VERB LIST WITH VERB VARIATIONS

This list resulted from expanding the 108 root verbs of the Navy Verb List with their substitutes. The root verbs were originally found in DOD-STD-1685(SH). The expanded Navy Verb List contains 431 different verb-substitute forms. These forms of the Navy Verb List were actually used in the Computer Readability Editing System.

Word to be Substituted	First Substitute	Second Substitute
ACCOMPLISH	PERFORM	DO
ACCOMPLISHED	PERFORMED	DID/DONE
ACCOMPLISHES	PERFORMS	DOES
ACCOMPLISHING	PERFORMING	DOING
ACTUATE	OPERATE	MOVE
ACTUATED	OPERATED	MOVED
ACTUATES	OPERATES	MOVES
ACTUATING	OPERATING	MOVING
ADVANCE	MOVE FOWARD	MOVE AHEAD
ADVANCED	MOVED FORWARD	MOVED AHEAD
ADVANCES	MOVES FORWARD	MOVES AHEAD
ADVANCING	MOVING FOWARD	MOVING AHEAD
ADVISE	REPORT TO	TELL
ADVISED	REPORTED TO	TOLD
ADVISES	REPORTS TO	TELLS
ADVISING	REPORTING TO	TELLING
AGITATE	SHAKE	
AGITATED	SHOOK/SHAKEN	
AGITATES	SHAKES	
AGITATING	SHAKING	
AID	HELP	
AIDED	HELPED	
AIDING	HELPING	
AIDS	HELPS	
ALERT	WARN	
ALERTED	WARNED	
ALERTING	WARNING	
ALERTS	WARNS	
ALLOCATE	ASSIGN	DISTRIBUTE
ALLOCATED	ASSIGNED	DISTRIBUTED
ALLOCATES	ASSIGNS	DISTRIBUTES
ALLOCATING	ASSIGNING	DISTRIBUTING
ALLOW	LET	WAIT FOR
ALLOWED	LET	WAITED FOR
ALLOWING	LETTING	WAITING FOR
ALLOWS	LETS	WAITS FOR
ALTERNATE	GO BACK AND FORTH	
ALTERNATED	WENT BACK AND FORTH	GONE BACK AND FORTH
ALTERNATES	GOES BACK AND FORTH	
ALTERNATING	GOING BACK AND FORTH	
ANALYZE	THINK ABOUT	
ANALYZED	THOUGHT ABOUT	
ANALYZES	THINKS ABOUT	
ANALYZING	THINKING ABOUT	
ARRANGE	PUT IN ORDER	
ARRANGED	PUT IN ORDER	
ARRANGES	PUTS IN ORDER	
ARRANGING	PUTTING IN ORDER	
ASCERTAIN	BE SURE	
ASCERTAINED	WAS/WERE SURE	
ASCERTAINING	BEING SURE	
ASCERTAINS	IS SURE	

Word to be Substituted	First Substitute	Second Substitute
ASSESS	EVALUATE	
ASSESSED	EVALUATED	
ASSESSES	EVALUATES	
ASSESSING	EVALUATING	
ASSIST	HELP	
ASSISTED	HELPED	
ASSISTING	HELPING	
ASSISTS	HELPS	
ASSURE	TELL	REPORT TO
ASSURED	TOLD	REPORTED TO
ASSURES	TELLS	REPORTS TO
ASSURING	TELLING	REPORTING TO
CATEGORIZE	CLASSIFY	
CATEGORIZED	CLASSIFIED	
CATEGORIZES	CLASSIFIES	
CATEGORIZING	CLASSIFYING	
CHANGE	REPLACE	MODIFY
CHANGED	REPLACED	MODIFIED
CHANGES	REPLACES	MODIFIES
CHANGING	REPLACING	MODIFYING
CHANNEL	FORM	CUT
CHANNELED	FORMED	CUT
CHANNELING	FORMING	CUTTING
CHANNELLED	FORMED	CUT
CHANNELLING	FORMING	CUTTING
CHANNELS	FORMS	CUTS
CHECK	BE SURE	
CHECKED	WAS/WERE SURE	
CHECKING	BEING SURE	
CHECKS	IS SURE	
COMMUNICATE	REPORT TO	TELL
COMMUNICATED	REPORTED TO	TOLD
COMMUNICATES	REPORTS TO	TELLS
COMMUNICATING	REPORTING TO	TELLING
COMPILE	COLLECT	
COMPILED	COLLECTED	
COMPILES	COLLECTS	
COMPILING	COLLECTING	
COMPLIED	FOLLOWED	
COMPLIES	FOLLOWS	
COMPLY	FOLLOW	
COMPLYING	FOLLOWING	
COMPUTE	CALCULATE	
COMPUTED	CALCULATED	
COMPUTES	CALCULATES	
COMPUTING	CALCULATING	
CONFER	ASK	
CONFERRED	ASKED	
CONFERRING	ASKING	
CONFERS	ASKS	
CONSTRUCT	MAKE	BUILD
CONSTRUCTED	MADE	BUILT

Word to be Substituted	First Substitute	Second Substitute
CONSTRUCTING	MAKING	BUILDING
CONSTRUCTS	MAKES	BUILDS
DEPRESS	PRESS	PUSH
DEPRESSED	PRESSED	PUSHED
DEPRESSES	PRESSES	PUSHES
DEPRESSING	PRESSING	PUSHING
DEPRESSURIZE	RELEASE PRESSURE	
DEPRESSURIZED	RELEASED PRESSURE	
DEPRESSURIZES	RELEASES PRESSURE	
DEPRESSURIZING	RELEASING PRESSURE	
DETERMINE	MEASURE	BE SURE
DETERMINED	MEASURED	WAS/WERE SURE
DETERMINES	MEASURES	IS SURE
DETERMINING	MEASURING	BEING SURE
DISCONNECT	UNPLUG	
DISCONNECTED	UNPLUGGED	
DISCONNECTING	UNPLUGGING	
DISCONNECTS	UNPLUGS	
DISENGAGE	RELEASE	UNLOCK
DISENGAGED	RELEASED	UNLOCKED
DISENGAGES	RELEASES	UNLOCKS
DISENGAGING	RELEASING	UNLOCKING
DISMANTLE	DISASSEMBLE	
DISMANTLED	DISASSEMBLED	
DISMANTLES	DISASSEMBLES	
DISMANTLING	DISASSEMBLING	
DISPATCH	SEND	
DISPATCHED	SENT	
DISPATCHES	SENDS	
DISPATCHING	SENDING	
DISTRIBUTE	HAND OUT	SPREAD OUT
DISTRIBUTED	HANDED OUT	SPREAD OUT
DISTRIBUTES	HANDS OUT	SPREADS OUT
DISTRIBUTING	HANDING OUT	SPREADING OUT
EFFECT	PERFORM	DO
EFFECTED	PERFORMED	DID/DONE
EFFECTING	PERFORMING	DOING
EFFECTS	PERFORMS	DOES
ELIMINATE	GET RID OF	
ELIMINATED	GOT/GOTTEN RID OF	
ELIMINATES	GETS RID OF	
ELIMINATING	GETTING RID OF	
EMPLOY	USE	
EMPLOYED	USED	
EMPLOYING	USING	
EMPLOYS	USES	
ENSURE	BE SURE	
ENSURED	WAS/WERE SURE	
ENSURES	IS SURE	
ENSURING	BEING SURE	
ENTER	GO IN	COME IN
ENTERED	WENT/GONE IN	CAME IN

Word to be Substituted	First Substitute	Second Substitute
ENTERING	GOING IN	COMING IN
ENTERS	GOES IN	COMES IN
ERECT	SET UP	PUT TOGETHER
ERECTED	SET UP	PUT TOGETHER
ERECTING	SETTING UP	PUTTING TOGETHER
ERECTS	SETS UP	PUTS TOGETHER
EXAMINE	INSPECT	
EXAMINED	INSPECTED	
EXAMINES	INSPECTS	
EXAMINING	INSPECTING	
EXTEND	STRETCH OUT	MAKE LONGER
EXTENDED	STRETCHED OUT	MADE LONGER
EXTENDING	STRETCHING OUT	MAKING LONGER
EXTENDS	STRETCHES OUT	MAKES LONGER
EXTRACT	PULL OUT	
EXTRACTED	PULLED OUT	
EXTRACTING	PULLING OUT	
EXTRACTS	PULLS OUT	
FABRICATE	MAKE	BUILD
FABRICATED	MADE	BUILT
FABRICATES	MAKES	BUILDS
FABRICATING	MAKING	BUILDING
FIGURE	CALCULATE	
FIGURED	CALCULATED	
FIGURES	CALCULATES	
FIGURING	CALCULATING	
FIND	MEASURE	
FINDING	MEASURING	
FINDS	MEASURES	
FOUND	MEASURED	
FURNISH	GIVE	
FURNISHED	GAVE/GIVEN	
FURNISHES	GIVES	
FURNISHING	GIVING	
GUIDE	INSERT CAREFULLY	
GUIDED	INSERTED CAREFULLY	
GUIDES	INSERTS CAREFULLY	
GUIDING	INSERTING CAREFULLY	
IMMERSE	SUBMERGE	
IMMERSED	SUBMERGED	
IMMERSES	SUBMERGES	
IMMERSING	SUBMERGING	
INDICATE	POINT OUT	TELL
INDICATED	POINTED OUT	TOLD
INDICATES	POINTS OUT	TELLS
INDICATING	POINTING OUT	TELLING
INFORM	TELL	REPORT TO
INFORMED	TOLD	REPORTED TO
INFORMING	TELLING	REPORTING TO
INFORMS	TELLS	REPORTS TO
INITIATE	START	BEGIN
INITIATED	STARTED	BEGAN/BEGUN

Word to be Substituted	First Substitute	Second Substitute
INITIATES	STARTS	BEGINS
INITIATING	STARTING	BEGINNING
INJECT	FORCE	
INJECTED	FORCED	
INJECTING	FORCING	
INJECTS	FORCES	
INSURE	BE SURE	
INSURED	WAS/WERE SURE	
INSURES	IS SURE	
INSURING	BEING SURE	
INTERPRET	EXPLAIN	
INTERPRETED	EXPLAINED	
INTERPRETING	EXPLAINING	
INTERPRETS	EXPLAINS	
JOIN	ATTACH	CONNECT
JOINED	ATTACHED	CONNECTED
JOINING	ATTACHING	CONNECTING
JOINS	ATTACHES	CONNECTS
LOCATE	FIND	
LOCATED	FOUND	
LOCATES	FINDS	
LOCATING	FINDING	
MARK	TAG	
MARKED	TAGGED	
MARKING	TAGGING	
MARKS	TAGS	
MATE	ATTACH	CONNECT
MATED	ATTACHED	CONNECTED
MATES	ATTACHES	CONNECTS
MATING	ATTACHING	CONNECTING
MONITOR	WATCH	
MONITORED	WATCHED	
MONITORING	WATCHING	
MONITORS	WATCHES	
MOUNT	INSTALL	ATTACH
MOUNTED	INSTALLED	ATTACHED
MOUNTING	INSTALLING	ATTACHING
MOUNTS	INSTALLS	ATTACHES
NOTIFIED	REPORTED TO	TOLD
NOTIFIES	REPORTS TO	TELLS
NOTIFY	REPORT TO	TELL
NOTIFYING	REPORTING TO	TELLING
OBSERVE	WATCH	OBEY
OBSERVED	WATCHED	OBEYED
OBSERVES	WATCHES	OBEYS
OBSERVING	WATCHING	OBEYING
OBTAIN	GET	
OBTAINED	GOT/GOTTEN	
OBTAINING	GETTING	
OBTAINS	GETS	
ORDER	PUT IN ORDER	REQUISITION
ORDERED	PUT IN ORDER	REQUISITIONED

Word to be Substituted	First Substitute	Second Substitute
ORDERING	PUTTING IN ORDER	REQUISITIONING
ORDERS	PUTS IN ORDER	REQUISITIONS
ORIENT	PUT	SET
ORIENTED	PUT	SET
ORIENTING	PUTTING	SETTING
ORIENTS	PUTS	SETS
ORIGINATE	START	
ORIGINATED	STARTED	
ORIGINATES	STARTS	
ORIGINATING	STARTING	
PLACE	PUT	SET
PLACED	PUT	SET
PLACES	PUTS	SETS
PLACING	PUTTING	SETTING
POSITION	PUT	SET
POSITIONED	PUT	SET
POSITIONING	PUTTING	SETTING
POSITIONS	PUTS	SETS
PRE-SET	SET	
PRE-SETS	SETS	
PRE-SETTING	SETTING	
PROVIDE	GIVE	
PROVIDED	GAVE/GIVEN	
PROVIDES	GIVES	
PROVIDING	GIVING	
READIED	PREPARED	
READIES	PREPARES	
READJUST	ADJUST	
READJUSTED	ADJUSTED	
READJUSTING	ADJUSTING	
READJUSTS	ADJUSTS	
READY	PREPARE	
READYING	PREPARING	
REASSEMBLE	ASSEMBLE	
REASSEMBLED	ASSEMBLED	
REASSEMBLES	ASSEMBLES	
REASSEMBLING	ASSEMBLING	
RECAP	CAP	
RECAPPED	CAPPED	
RECAPPING	CAPPING	
RECAPS	CAPS	
RECEIVE	GET	
RECEIVED	GOT/GOTTEN	
RECEIVES	GETS	
RECEIVING	GETTING	
RECONNECT	CONNECT	
RECONNECTED	CONNECTED	
RECONNECTING	CONNECTING	
RECONNECTS	CONNECTS	
RECORD	WRITE	WRITE IN
RECORDED	WROTE/WRITTEN	WROTE/WRITTEN IN
RECORDING	WRITTING	WRITTING IN

Word to be Substituted	First Substitute	Second Substitute
RECORDS	WRITES	WRITES IN
REINFLATE	INFLATE	
REINFLATED	INFLATED	
REINFLATES	INFLATES	
REINFLATING	INFLATING	
REINSTALL	INSTALL	
REINSTALLED	INSTALLED	
REINSTALLING	INSTALLING	
REINSTALLS	INSTALLS	
REJECT	DO NOT USE	DESTROY
REJECTED	DID NOT USE	DESTROYED
REJECTING	IS/WAS NOT USING	DESTROYING
REJECTS	DOES NOT USE	DESTROYS
RELAY	GIVE	TELL
RELAYED	GAVE/GIVEN	TOLD
RELAYING	GIVING	TELLING
RELAYS	GIVES	TELLS
RELIEVE	REDUCE	
RELIEVED	REDUCED	
RELIEVES	REDUCES	
RELIEVING	REDUCING	
REPLACE	PUT BACK	INSTALL NEW
REPLACED	PUT BACK	INSTALLED NEW
REPLACES	PUTS BACK	INSTALLS NEW
REPLACING	PUTTING BACK	INSTALLING NEW
REPRESSURIZE	PRESSURIZE	
REPRESSURIZED	PRESSURIZED	
REPRESSURIZES	PRESSURIZES	
REPRESSURIZING	PRESSURIZING	
REQUEST	ASK FOR	
REQUESTED	ASKED FOR	
REQUESTING	ASKING FOR	
REQUESTS	ASKS FOR	
RESET	SET	
RESETS	SETS	
RESETTING	SETTING	
RETARD	HOLD BACK	SLOW DOWN
RETARDED	HELD BACK	SLOWED DOWN
RETARDING	HOLDING BACK	SLOWING DOWN
RETARDS	HOLDS BACK	SLOWS DOWN
RETRACT	PULL BACK	
RETRACTED	PULLED DOWN	
RETRACTING	PULLING DOWN	
RETRACTS	PULLS BACK	
ROTATE	TURN	
ROTATED	TURNED	
ROTATES	TURNS	
ROTATING	TURNING	
ROUTE	SEND	
ROUTED	SENT	
ROUTES	SENDS	
ROUTING	SENDING	

Word to be Substituted	First Substitute	Second Substitute
SCAN	WATCH	
SCANNED	WATCHED	
SCANNING	WATCHING	
SCANS	WATCHES	
SELECT	CHOOSE	
SELECTED	CHOSE/CHOSEN	
SELECTING	CHOOSING	
SELECTS	CHOOSES	
STOP	SHUT DOWN	
STOPPED	SHUT DOWN	
STOPPING	SHUTTING DOWN	
STOPS	SHUTS DOWN	
STRICKEN	HIT	
STRICKING	HITTING	
STRIKE	HIT	
STRIKES	HITS	
STRUCK	HIT	
SUPERINTEND	SUPERVISE	
SUPERINTENDED	SUPERVISED	
SUPERINTENDING	SUPERVISING	
SUPERINTENDS	SUPERVISES	
SUPPORT	HOLD UP	
SUPPORTED	HELD UP	
SUPPORTING	HOLDING UP	
SUPPORTS	HOLDS UP	
TABULATE	MAKE A TABLE	LIST
TABULATED	MADE A TABLE	LISTED
TABULATES	MAKES A TABLE	LISTS
TABULATING	MAKING A TABLE	LISTENING
THREW	SET SWITCH TO	
THROW	SET SWITCH TO	
THROWING	SETTING SWITCH TO	
THROWN	SET SWITCH TO	
THROWS	SETS SWITCH TO	
TRANSFER	MOVE	
TRANSFERRED	MOVED	
TRANSFERRING	MOVING	
TRANSFERS	MOVES	
TRANSPORT	MOVE	
TRANSPORTED	MOVED	
TRANSPORTING	MOVING	
TRANSPORTS	MOVES	
UNCAP	REMOVE CAP	
UNCAPPED	REMOVED CAP	
UNCAPPING	REMOVING CAP	
UNCAPS	REMOVES CAP	
UNPLUG	REMOVE PLUG	
UNPLUGGED	REMOVED PLUG	
UNPLUGGING	REMOVING PLUG	
UNPLUGS	REMOVES PLUG	
UNSCREW	REMOVE SCREW	
UNSCREWED	REMOVED SCREW	

Word to be Substituted	First Substitute
UNSCREWING	REMOVING SCREW
UNSCREWS	REMOVES SCREW
UTILIZE	USE
UTILIZED	USED
UTILIZES	USES
UTILIZING	USING
VERIFIED	WAS/WERE SURE
VERIFIES	IS SURE
VERIFY	BE SURE
VERIFYING	BEING SURE
WITHDRAW	PULL OUT
WITHDRAWING	PULLING OUT
WITHDRAWN	PULLED OUT
WITHDRAWS	PULLS OUT
WITHDREW	PULLED OUT

APPENDIX F

THE TEST PASSAGES

These test passages were used to evaluate the performance of the features of the Computer Readability Editing System. Complete references on the sources of the passages are contained at the end of the appendix. The heading of each passage gives the manual number and paragraph number of that passage. The passages are presented in two main groups: (1) the NAVSEA passages and (2) the instructional and procedural passages. The third group, the FORCAST and Kincaid passages, have been published elsewhere. The FORCAST passages are available in Caylor, Sticht, Fox, and Ford (1973) and the Kincaid passages in Kincaid, Fishburne, Rogers, and Chissom (1975).

TEST PASSAGES FROM THE NAVSEA MANUAL

NAVSEA S9086-BH-STM-00/CH 041. PARAGRAPHS 041-1.1 THROUGH 041-1.4

SECTION 1GENERAL 041-1.1GENERAL 041-1.2THIS SECTION CONTAINS THE BASIC REGULATIONS AND REFERENCES TO REGULATIONS PERTAINING TO THE ADMINISTRATION OF FUNDS APPROPRIATED FOR PROGRAMS ASSIGNED TO THE NAVAL SEA SYSTEMS COMMAND (NAVSEA). 041-1.3SOURCES OF AUTHORITY 041-1.4IN ORDER TO CONDUCT THE FUNCTIONS WITH WHICH NAVSEA IS CHARGED IN NAVY REGULATIONS AND OTHER SECRETARY OF THE NAVY (SECNAV) INSTRUCTIONS. REQUESTS FOR FUNDS ARE MADE ANNUALLY VIA VARIOUS LEVELS OF EXECUTIVE REVIEW TO THE CONGRESS. RESULTANT FUNDS APPROPRIATED BY THE CONGRESS ARE MADE AVAILABLE TO THE COMMANDER, NAVSEA THROUGH THE APPORTIONMENT PROCEDURES OF THE EXECUTIVE BRANCH VIA SECRETARY OF DEFENSE (COMPTROLLER) AND SECRETARY OF THE NAVY. TITLE IV OF THE NATIONAL SECURITY ACT OF 1947, AS AMENDED, PRESCRIBES HOW DEPARTMENT OF DEFENSE BUDGET ESTIMATES SHALL BE PREPARED, PRESENTED, AND JUSTIFIED; ESTABLISHES THE FUNCTIONS OF THE DEPARTMENTAL COMPTROLLER ORGANIZATION; AND PRESCRIBES THE USES OF WORKING CAPITAL FUNDS. SECTION 3679 OF THE REVISED STATUTES, AS AMENDED, PROVIDES THAT ALL AGENCIES OF THE GOVERNMENT RECEIVING APPROPRIATIONS OF PUBLIC FUNDS WILL ESTABLISH ADMINISTRATIVE REGULATIONS TO PREVENT OVER-EXPENDITUR OR OVER-OBLIGATION OF FUNDS AND WILL REQUIRE MAINTENANCE OF ACCOUNTING RECORDS TO PROVIDE FULL DISCLOSURE OF FINANCIAL OPERATIONS. IMPLEMENTING THESE LAWS, THE SECRETARY OF DEFENSE (COMPTROLLER) AND THE SECRETARY OF THE NAVY (COMPTROLLER) HAVE ISSUED ADMINISTRATIVE REGULATIONS, APPLICABLE TO THE FINANCIAL OPERATIONS OF THE COMMANDS, WHICH ARE EMBODIED IN DOD, SECNAV, AND NAVCOMPT DIRECTIVES AND INSTRUCTIONS, AND NAVCOMPT AND NAVAL SUPPLY SYSTEMS COMMAND MANUALS. ADDITIONAL INSTRUCTIONS APPLICABLE TO FUNDS OF NAVSEA ARE PROMULGATED BY AMENDMENTS TO THE NAVCOMPT AND NAVAL SUPPLY SYSTEMS COMMAND MANUALS, AND BY NAVSEA NOTICES AND INSTRUCTIONS. IT IS INTENDED THAT THIS CHAPTER SERVE AS A GENERAL FINANCIAL GUIDE IN PROGRAMS ADMINISTERED BY NAVSEA WITH SPECIFIC INSTRUCTIONS AND REGUL
TIONS BEING PROVIDED IN THE AFOREMENTIONED SOURCES. SECTION 2
RESPONSIBILITIE 041-2.1NAVSEA RESPONSIBILITY

041-2.2THE COMMANDER, NAVAL SEA SYSTEMS COMMAND, IS RESPONSIBLE TO THE SECRETARY OF THE NAVY (COMPTROLLER) FOR THE PREPARATION OF APPROPRIATION BUDGETS @ FOR PROGRAMS WITHIN HIS TECHNICAL COGNIZANCE AND FOR THE ADMINISTRATION OF APPROPRIATED FUNDS RECEIVED FROM THE OFFICE OF MANAGEMENT AND BUDGET INCLUDING ESTIMATED REIMBURSEMENTS, TRANSFERS, AND ALL OTHER ITEMS OF ANTICIPATED RECEIPTS. HE HAS AUTHORITY WITHIN THE STATUTORY LANGUAGE OF THE APPROPRIATIONS AND THE APPORTIONMENT SCHEDULE TO EMPLOY ALLOCATED FUNDS AS HE MAY DEEM PROPER IN THE EXECUTION OF THE PROGRAMS. HE IS ALSO RESPONSIBLE FOR THE ESTABLISHMENT OF ADEQUATE FUNDS CONTROL RECORDS, AND FOR ENSURING THAT THE OFFICIAL ACCOUNTING RECORDS MAINTAINED BY THE NAVAL MATERIAL COMMAND SUPPORT ACTIVITY PROVIDE FULL DISCLOSURE OF THE FINANCIAL OPERATIONS AND RESOURCES DERIVED FROM APPROPRIATIONS AND FUNDS ASSIGNED TO NAVSEA FOR ADMINISTRATIVE CONTROL. HE HAS POWER TO DELEGATE THIS AUTHORITY, AND HAS DONE SO, WITH FURTHER REDELEGATION AUTHORIZED, TO HIS COMPTROLLER WHOSE FUNCTIONS ARE CONTAINED IN PARAGRAPH 041-2.7.

041-2.3CONCURRE WITH THE RESPONSIBILITY FOR ADMINISTRATION OF FUNDS IS THE RESPONSIBILITY FOR DETERMINING PROGRESS ACHIEVED IN THE ACCOMPLISHMENT OF AUTHORIZED PROGRAMS. THE ACCURATE AND TIMELY PREPARATION OF STATISTICAL AND FINANCIAL DATA COMPILED FOR MANAGEMENT OF @ NAVSEA PROGRAMS IS ALSO PART OF THE FINANCIAL STEWARDSHIP VESTED IN THE COMMANDER AND DELEGATED BY HIM TO HIS PRIMARY OFFICERS COGNIZANT OF VARIOUS PARTS OF ASSIGNED PROGRAMS.

041-2.4GENERAL CONCEPT OF THE COMPTROLLER FUNCTION 041-2.5THE

SECRETARY OF THE NAVY HAS PROMULGATED THE FOLLOWING EXPLANATION OF THE COMPTROLLER FUNCTION FOR GUIDANCE: THE COMPTROLLER MUST PROVIDE TECHNICAL GUIDANCE AND DIRECTION TO THE CONDUCT OF SPECIFIC FACT COLLECTION SYSTEMS IN THE AREAS OF BUDGET FORMULATION AND EXECUTION, PROGRAM ANALYSIS, ACCOUNTING, PROGRESS REPORTS, AND STATISTICS. THE FULLY COORDINATED STAFF SERVICE PROVIDED BY THE COMPTROLLER SHOULD RELIEVE THE COMMANDING OFFICER OF MUCH OF THE BURDEN OF DETAILED FACT COLLECTION, COORDINATION, AND ANALYSIS. WHEN PROPERLY PERFORMED, COMPTROLLERSHIP WILL
ENABLE THE COMMANDING OFFICER TO SPEND MORE OF HIS TIME IN THE AREAS OF POLICY FORMULATION, DECISION, AND PROGRAM DIRECTION. 041-2.6NAVSEA COMPTROLLER RESPONSIBILITY 041-2.7THE COMPTROLLER IS THE OFFICER IN CHARGE OF THE PLANS, PROGRAMS, AND FINANCIAL MANAGEMENT OR COMPTROLLER DIRECTORATE WHICH IS COMPRISED OF FIVE APPROPRIATION DIVISIONS, THREE ACCOUNTING DIVISIONS, AS WELL AS SUPPORTING STAFF OFFICES. THESE DIVISIONS PERFORM FISCAL STAFF FUNCTIONS FOR ALL DIVISIONS OF NAVSEA ENGAGED IN EXECUTION OF THE GENERAL FINANCIAL PLAN FOR EACH FUNDED PROGRAM. THE AUTHORITY OF THE COMMANDER, NAVSEA FOR THE ADMINISTRATIVE CONTROL OF APPROPRIATIONS AND FUNDS ALLOCATED OR OTHERWISE MADE AVAILABLE TO NAVSEA HAS BEEN DELEGATED TO THE COMPTROLLER . SUBJECT TO THE DIRECTION AND CONTROL OF THE COMMANDER, NAVSEA, THE COMPTROLLER WILL PERFORM THE FOLLOWING FUNCTIONS: PREPARE AND SIGN ALL COMMAND REQUESTS FOR BUDGET ACTIVITY ALLOCATIONS, APPORTIONMENTS, AND REAPPORTIONMENT ESTABLISH AND DEFINE PROJECTS AND SUBPROJECTS IN APPROVED COMMAND PROGRAMS. MAKE INTERNAL ALLOCATIONS TO SUCH PROJECTS AND SUBPROJECTS WITHIN THE APPORTIONMENTS OR REAPPORTIONMENT AND BUDGET ACTIVITY ALLOCATIONS APPROVED BY
AUTHORITY. APPROVE OR DISAPPROVE, ON THE BASIS OF THE APPROVED FINANCIAL PLAN, ALL REQUESTS FOR THE ISSUANCE OF DOCUMENTS COMMITTING, OBLIGATING, OR AUTHORIZING THE EXPENDITURE OF FUNDS. REQUIRE ACCOUNTING RECORDS TO BE MAINTAINED. ESTABLISH, OR REQUIRE TO BE ESTABLISHED, FISCAL CONTROLS WHICH WILL PREVENT OVERCOMMITMENT, OVEROBLIGATION, OR OVER-EXPENDITUR OF FUNDS, APPORTIONMENTS, REAPPORTIONMENT OR SUBDIVISIONS THEREOF. THE COMPTROLLER IS ALSO AUTHORIZED TO PERFORM AUDITS IN NAVSEA, FIELD ACTIVITIES, AND COMMANDS WHERE NAVSEA HAS BEEN ASSIGNED COMMAND. 041-2.8DELEGATE FIELD RESPONSIBILITY 041-2.9EACH COMMAND OR ACTIVITY AUTHORIZED BY NAVSEA TO OBLIGATE OR EXPEND APPROPRIATED FUNDS WILL ADMINISTER AND ACCOUNT FOR SUCH FUNDS IN COMPLIANCE WITH APPLICABLE FEDERAL LAW, APPLICABLE DEPARTMENT OF DEFENSE REGULATIONS AND NAVCOMPT INSTRUCTIONS, AND SUCH SUPPLEMENTARY NAVSEA INSTRUCTIONS AS MAY BE ISSUED

TEST PASSAGES FROM THE NAVSEA MANUAL

NAVSEA S9086-BH-STM-00/CH 079. PARAGRAPHS 079-20.1 THROUGH 079-21.6

ON THE MORE DETAILED PHASES OF SPECIFIC PROGRAMS.

CHAPTER 079 DAMAGE CONTROL VOLUME 2 PRACTICAL DAMAGE CONTROL SECTION 20 GENERAL 079-20.1 BASIC DAMAGE CONTROL CONSIDERATIONS 079-20.2 THE MOST IMPORTANT PHASE OF DAMAGE CONTROL IS THAT WHICH TAKES PLACE BEFORE DAMAGE HAPPENS. ONLY THROUGH TRAINING. EXERCISES. TESTS. AND INSPECTIONS CAN PERSONNEL OF THE SHIP OBTAIN THE CAPABILITY AND KNOWLEDGE OF HOW TO ACT WHEN ACTION IS NEEDED. 079-20.3 IT IS TOO LATE TO START AN INTENSIVE DAMAGE CONTROL OR FIREFIGHTING PROGRAM WHEN THE SHIP IS SINKING OR INVOLVED WITH A CONFLAGRATION. TRAINING MUST START WHEN THE SHIP IS IN CHARGE OF A PRECOMMISSIONIN DETAIL AND MUST NEVER CEASE UNTIL THE SHIP IS STRICKEN FROM THE NAVY LIST. 079-20.4 THE INFORMATION IN THIS VOLUME IS NOT INTENDED TO SUPERSEDE. MAKE OBSOLETE. OR INVALIDATE ANY DIRECTIVE OR PUBLICATION PERTAINING TO TYPE. CLASS. OR PARTICULAR SHIP ISSUED BY COMPETENT AUTHORITY. 079-20.5 ANY REFERENCE TO THE DAMAGE CONTROL OFFICER SHALL BE INTERPRETED TO MEAN THAT OFFICER IN THE CHAIN OF COMMAND, WHO IS AUTHORIZED AND ASSIGNED THE RESPONSIBILITY FOR THE DAMAGE CONTROL ORGANIZATION IN ALL MATTERS. INCLUDING MAKING DECISIONS AND TAKING ACTION. 079-20.6 OBJECTIVES. THE THREE BASIC OBJECTIVES OF SHIPBOARD DAMAGE CONTROL ARE: TO TAKE ALL PRACTICABLE PRELIMINARY ACTION. BEFORE DAMAGE OCCURS, SUCH AS MAINTENANCE OF WATERTIGHT AND AIRTIGHT INTEGRITY. PRESERVATION OF RESERVE BUOYANCY AND STABILITY. REMOVAL OF FIRE HAZARDS. AND UPKEEP AND DISTRIBUTION OF EMERGENCY EQUIPMENT. TO MINIMIZE AND LOCALIZE SUCH DAMAGE AS DOES OCCUR, BY SUCH ACTIONS AS CONTROL OF FLOODING. PRESERVATION OF STABILITY AND BUOYANCY..COMBATING FIRE. AND FIRST-AID TREATMENT OF PERSONNEL. TO ACCOMPLISH EMERGENCY REPAIRS OR RESTORATIONS AS QUICKLY AS POSSIBLE AFTER THE OCCURRENCE OF DAMAGE. BY SUCH ACTIONS AS SUPPLYING CASUALTY POWER, REGAINING A SAFE MARGIN OF STABILITY AND BUOYANCY. REINFORCING DAMAGED STRUCTURES. AND MANNING ESSENTIAL EQUIPMENT. 079-20.7 THE SHIPS ABILITY TO INFLICT PUNISHMENT UPON AND DESTROY AN ENEMY OR TO PERFORM ANY OTHER ASSIGNED MISSION MAY DEPEND

UPON THE EFFECTIVENESS OF DAMAGE CONTROL PROCEDURES. IT IS ESSENTIAL THAT EVERY MEMBER OF THE SHIPS COMPANY RECOGNIZE HIS RESPONSIBILITY AND ITS IMPORTANCE. 079-20.8 DAMAGE CONTROL MUST BE CONSIDERED AS AN OFFENSIVE, AS WELL AS A DEFENSIVE FUNCTION. 079-20.9 SCOPE. DAMAGE CONTROL IS CONCERNED NOT ONLY WITH BATTLE DAMAGE BUT ALSO WITH NONBATTLE DAMAGE SUCH AS FIRE, COLLISION. GROUNDING. OR EXPLOSION. IT MAY BE NECESSARY IN PORT AS WELL AS AT SEA. AND MAY INVOLVE THE USE OF PERSONNEL AND FACILITIES OF AN UNDAMAGED SHIP. 079-20.10 NECESSARY KNOWLEDGE 079-20.11 DAMAGE CONTROL REQUIRES A DETAILED KNOWLEDGE OF SHIP CONSTRUCTION. CHARACTERISTICS COMPARTMENTATIO STABILITY. AND OF THOSE APPURTENANCES PLACED IN A SHIP TO PREVENT OR CONTROL DAMAGE SHOULD THE SHIP BE ENDANGERED. 079-20.12 THE CONTROL OF DAMAGE DEPENDS UPON THE ABILITY AND INITIATIVE OF PERSONNEL TO TAKE PROMPT CORRECTIVE ACTION. USING THE MATERIAL WHICH IS READILY AVAILABLE. HAVING A THOROUGH KNOWLEDGE OF THE SHIP WILL ENABLE PERSONNEL TO DETERMINE READILY THE CORRECTIVE ACTION TO BE TAKEN. 079-20.13 THIS VOLUME PRESENTS, OR INCORPORATES BY REFERENCE TO OTHER NAVAL SHIPS TECHNICAL MANUAL (NSTM) CHAPTERS. INFORMATION CONCERNING THOSE FEATURES OF DAMAGE CONTROL AS A RESPONSIBILITY OF THE NAVAL SEA SYSTEMS COMMAND (NAVSEA) WHICH ARE OF GENERAL APPLICATION. BULLETINS. INDIVIDUAL SHIPS DAMAGE CONTROL BOOKS, AND EQUIPMENT INSTRUCTION PAMPHLETS CONTAIN ADDITIONAL OR MORE SPECIFIC

MATERIAL. DOCTRINES AND INSTRUCTIONS CONCERNING ORGANIZATION AND TRAINING ARE PROMULGATED BY THE CHIEF OF NAVAL OPERATIONS (CNO). THE CHIEF OF NAVAL PERSONNEL. AND AFLOAT COMMANDERS. 079-20.14 DAMAGE CONTROL BOOKS SURFACE SHIPS. DAMAGE CONTROL BOOKS ISSUED BY NAVSEA CONTAIN INFORMATION IN THE FORM OF TEXT. TABLES. AND DIAGRAMS CONCERNING DAMAGE CONTROL FACILITIES AND CHARACTERISTICS COMPARTMENTATION PIPING. AND WIRING SYSTEMS. THE BOOKS ARE SUPPLIED TO FLEET COMMANDERS. FORCE COMMANDERS. DIVISION COMMANDERS, SQUADRON COMMANDERS. AND COMMANDING OFFICERS OF SHIPS AND OTHER NAVAL ACTIVITIES. IN ACCORDANCE WITH THEIR REQUIREMENTS. A RECORD OF ALL BOOKS DISTRIBUTED IS MAINTAINED BY NAVSEA: THEY SHALL NOT BE TRANSFERRED WITHOUT NAVSEA AUTHORITY. RECIPIENTS ARE CONSIDERED RESPONSIBLE FOR BOOKS TO THE SAME EXTENT AS FOR SHIPS PLANS AND SPECIFICATIONS. CUSTODIANS OF THE BOOKS, UPON DETACHMENT. SHALL INSURE THAT ALL BOOKS ARE ACCOUNTED FOR AND TURNED OVER TO THEIR SUCCESSORS. WHEN THE STATUS OF A SHIP IS CHANGED FROM ACTIVE TO RESERVE. THE OVERHAULING ACTIVITY WILL REVISE THE MASTER COPY AND FORWARD IT TO NAVSEA. 079-20.15 DAMAGE CONTROL BOOKS ARE SUPPLIED TO SHIPS IN THE RESERVE FLEET. RESERVE FLEET COMMANDERS SHALL TAKE ACTION TO ASCERTAIN THAT THE LATEST DAMAGE CONTROL BOOKS ARE MADE AVAILABLE TO THE OVERHAULING ACTIVITY PRIOR TO AN AVAILABILITY. 079-20.16 WHEN A SHIP IS DECOMMISSIONED AND SCHEDULED FOR DISPOSAL OR SCRAPPING. THE DAMAGE CONTROL BOOKS (TEXT AND DIAGRAMS) SHALL BE BURNED AND THEIR DISPOSITION REPORTED TO NAVSEA. 079-20.17 DAMAGE CONTROL BOOKS ARE SUPPLIED TO ALL COMBATANT. MISCELLANEOUS. AND AUXILIARY SHIPS OVER 220 FEET IN LENGTH (INCLUDING FLOATING DRYDOCKS), AND TO CERTAIN SMALL FLEET-OPERATED SHIPS UNDER 220 FEET IN LENGTH, SUCH AS MINE WARFARE SHIPS. 079-20.18 FOR OTHER SHIPS. DAMAGE CONTROL BOOKS MAY BE INDEPENDENTLY DEVELOPED BY THE SHIP. 079-20.19 REQUESTS FOR DAMAGE CONTROL BOOKS SHALL BE IN ACCORDANCE WITH CHAPTER 080 (9001). PUBLICATIONS AND DRAWINGS. 079-20.20 DAMAGE CONTROL DIAGRAMS. DAMAGE CONTROL DIAGRAMS ARE THREE-DIMENSION ISOMETRIC DIAGRAMS. THEY ARE DEVELOPED AND PROVIDED UNDER RIGID REQUIREMENTS ESTABLISHED BY NAVSEA AND ARE SUPPLIED TO SHIPS. ON ALL DIAGRAMS. EACH COMPARTMENT. TANK. VOID OR OTHER AREA WILL BE DESIGNATED BY NUMBER. LETTER. OR COMBINATION THEREOF. THE VARIOUS SYSTEMS SUCH AS PIPING AND COMMUNICATIONS ARE REPRESENTED AS NEAR TO ACTUAL INSTALLATIONS AS PRACTICABLE AND ARE DESIGNATED BY COLORS. LETTERING. AND NUMERALS. AS WELL AS SYMBOLS. 079-20.21 FIGURE 079-100 ILLUSTRATES SOME OF THE SYMBOLS USED IN DAMAGE CONTROL DIAGRAMS. FIGURE 079-100. DAMAGE CONTROL DIAGRAM SYMBOLS 079-20.22 EACH DECK OR PLATFORM IS SHOWN AS A SEPARATE LEVEL. COMPARTMENTS NOT INTERSECTED BY DECKS OR PLATFORMS ARE DRAWN AS PART OF THE DECK FROM WHICH THEY EXTEND. HEAVY LINES ARE USED TO INDICATE WATERTIGHT AND OILTIGHT BOUNDARIES: LIGHTER LINES INDICATE AIRTIGHT. FUMETIGHT. AND NON-TIGHT BOUNDARIES. DOTTED LINES AND CROSSHATCHING ARE USED TO INDICATE HIDDEN BOUNDARIES. PIPING. AND VALVES. THE VISIBLE PIPING IS REPRESENTED BY SOLID LINES. PIPING WHICH PIERCES A BULKHEAD HAS A CIRCLE SHOWING THE POINT OF PENETRATION. THERE IS NO CIRCLING AT THE POINT OF DECK PENETRATION. 079-20.23 FIGURE 079-101 (TWO SHEETS) IS A TYPICAL DAMAGE CONTROL DIAGRAM SHOWING THE UTILIZATION OF THE DIAGRAM SYMBOLS. FIGURE 079-101. TYPICAL DAMAGE CONTROL DIAGRAM (SHEET 1 OF 2) FIGURE 079-101. TYPICAL DAMAGE CONTROL DIAGRAM (SHEET 2 OF 2) 079-20.24 DIAGRAMS MEASURING 38 BY 53 INCHES ARE SUPPLIED TO AIRCRAFT CARRIERS, HEAVY CRUISERS. AND MISCELLANEOUS LARGE SHIPS. EXCEPT: VITAL DAMAGE CONTROL ELECTRICAL EQUIPMENT AND POWER SUPPLY CHARTS ARE 38 BY 26 INCHES. COMMUNICATION DIRECTORIES ARE 38 BY 26 INCHES. LIQUID LOADING DIAGRAMS ARE EITHER 10 X 26 INCHES OR 10 BY 53 INCHES. 079-20.25 DIAGRAMS ARE SUPPLIED TO OTHER SHIPS IN THE FOLLOWING SIZES: GUIDED MISSILE CRUISERS AND COMPARABLE SIZE SHIPS LARGER THAN DESTROYERS AND SMALLER THAN HEAVY CRUISERS ARE 25 X 38 INCHES. DESTROYERS AND OTHER TYPES OF COMPARABLE SIZE ARE 16 BY 28 INCHES. MISCELLANEOUS VARIATIONS OF THE FOREGOING SIZES AS APPROVED BY NAVSEA. 079-20.26 SHIPS

REVISION RESPONSIBILITY. DAMAGE CONTROL BOOKS ARE AS NEARLY CORRECT AS POSSIBLE: HOWEVER. ERRORS ARE INEVITABLE. ACCURACY OF THE INFORMATION WILL BE REDUCED AS ALTERATIONS TO THE SHIP ARE MADE. EFFORTS SHOULD BE MADE TO MAINTAIN THE BOOKS TO REFLECT THE MOST RECENT INSTALLATIONS. 079-20.27 THE MASTER COPY CONSISTING OF DIAGRAMS AND TEXT SHALL BE KEPT CURRENT AT ALL TIMES. AND REVISIONS SHOULD BE CLEARLY MARKED SO THAT OTHER COPIES MAY BE REVISED FROM IT. ALL COPIES OF DAMAGE CONTROL BOOKS SHALL BE REVISED TO REFLECT ALTERATIONS MADE BY THE SHIPS FORCE OR ACTIVITIES OTHER THAN THE OVERHAUL ACTIVITY. ALTERATIONS ARE TO BE ENTERED ON THE MASTER COPY AS SOON AS THEY ARE COMPLETED. 079-20.28 WHEN NAVSEA FURNISHES DIAGRAMS AND TEXT FOR A CLASS. I.E.. A GROUP OF SHIPS. THE SHIPS FORCE SHALL CHECK AND REVISE THIS MATERIAL TO REFLECT THE ACTUAL INSTALLATION IN THE INDIVIDUAL SHIP. AT THE TIME OF EACH OVERHAUL. OR WHEN ALTERATIONS ARE MADE BY AN OVERHAUL ACTIVITY, THE COMMANDING OFFICER SHALL DELIVER THE MASTER AND ONE DUPLICATE COPY TO THE ACTIVITY. THESE COPIES SHALL BE HAND-CORRECTED OR RELITHOGRAPHED FOR THE PRECEDING OVERHAUL. AND THE ACTIVITY SHALL BE REQUESTED TO HAVE THE VOLUMES REVISED. REVISIONS WILL INCLUDE ALTERATIONS MADE BY THE ACTIVITY IN ADDITION TO ALL THE WORK ACCOMPLISHED BY THE SHIPS FORCE. AS SHOWN ON THE MASTER COPY. THE COMMANDING OFFICER SHALL ASCERTAIN THAT THE MASTER COPY HAS BEEN REVISED AND ACCURATELY REPRESENTS THE SHIP AT THE TIME OF ITS DEPARTURE FROM THE SHIP YARD. THE REVISIONS SHALL BE INCLUDED IN THE CURRENT SHIPS MAINTENANCE PROJECT (CSMP). IT SHALL BE STATED THEREIN WHETHER THE SHIPS FORCE REQUIRES ASSISTANCE FROM THE SHIPYARD IN CHECKING THE DAMAGE CONTROL DIAGRAMS AND/OR TEXT. 079-20.29 REVISIONS TO THE SHIPS MASTER COPY. BY SHIPS FORCE. SHALL BE MADE AS FOLLOWS: DELETIONS ON THE DIAGRAMS ARE TO BE INDICATED BY CROSSING OUT THE DELETED MATTER WITH RED INK. NO ERASURES SHALL BE MADE. NOR IS IT NECESSARY TO MAKE ANY NOTES ON THE DIAGRAMS TO INDICATE THAT THE MATTER IS TO BE DELETED. ADDITIONS TO THE DIAGRAM SHALL BE MADE IN ACCORDANCE WITH THE ESTABLISHED COLOR CODING SYSTEMS. INDICATE ADDITIONS IN THEIR CORRECT POSITIONS. EACH CHANGE OR ADDITION IS TO BE EMPHASIZED BY CIRCLING THE AREAS AFFECTED WITH RED INK. CHANGES IN THE NAMES OF COMPARTMENTS OR IN NOTES ON THE DIAGRAMS MAY BE MADE BY A MARGINAL NOTE. MINOR CHANGES. SUCH AS FROM NONTIGHT DUCT TO WATERTIGHT AND VICE VERSA. OR IN THE TYPE OF VALVE. CAN BE INDICATED BY A MARGINAL NOTE WITH A MARK TO INDICATE THE EXTENT OF THE CORRECTION. REVISIONS TO TEXT SHALL BE MADE IN RED INK. 079-20.30 OVERHAULING ACTIVITYS REVISION RESPONSIBILITY. WHEN DIAGRAMS ARE PROCESSED IN COLOR. THE ACTIVITY SHALL REVISE THEM AS FOLLOWS:

THE SHIPS MASTER COPY AND THE DUPLICATE COPY SHALL BE REVISED TO SUIT ALL CHANGES MADE DURING AN OVERHAUL. IN ACCORDANCE WITH MIL-STD- 784. THE REVISIONS MUST BE COMPLETED PRIOR TO THE SHIPS DEPARTURE FROM THE SHIPYARD. IF IT IS IMPOSSIBLE TO MEET THE SAILING DATE. THE OVERHAULING ACTIVITY SHALL INFORM NAVSEA IMMEDIATELY. AND INDICATE THE EARLIEST COMPLETION DATE AFTER DEPARTURE. THE OVERHAUL OF THE SHIP WILL NOT BE CONSIDERED COMPLETED UNTIL THE REVISIONS ARE MADE. DAMAGE CONTROL DIAGRAMS AND RELATED TEXT SHALL BE CHECKED AGAINST THE ACTUAL INSTALLATION IN THE SHIP. ONLY IF REQUIRED BY THE COMMANDING OFFICER. CHECKING SHALL NOT NECESSITATE THE REMOVAL OF BULKHEADS OR WIREWAYS. 079-20.31 THE DUPLICATE COPY OF THE REVISED SHIPS MASTER COPY DIAGRAMS AND TEXT SHALL BE RETURNED TO THE SHIP BEFORE DEPARTURE. THE LETTER FROM THE OVERHAULING ACTIVITY. FORWARDING THE DUPLICATE COPY TO THE SHIP. SHALL STATE THAT THE MATERIAL IS FOR INTERIM USE ONLY AND THAT THE EXISTING MATERIAL IN THE SHIP SHOULD NOT BE DESTROYED PENDING RECEIPT OF REPRINTED MATERIAL FROM NAVSEA. WHEN THE REPRINTED MATERIAL IS ISSUED. OBSOLETE COPIES SHALL BE DESTROYED BY BURNING. 079-20.32 WHEN THE SHIPS DAMAGE CONTROL DIAGRAMS ARE REPRODUCED IN HALFTONE. THE ACTIVITY SHALL REVISE THEM AS FOLLOWS: THE SHIPS MASTER COPY HALFTONE ILLUSTRATIONS AND RELATED TEXT SHALL BE REVISED TO SUIT ALL CHANGES MADE DURING AN OVERHAUL. INCLUDING ANY CHANGES MADE BY THE SHIPS FORCE. IN ACCORDANCE WITH MIL-STD-784. REVISIONS MUST BE COMPLETED PRIOR TO

SHIPS DEPARTURE. THE NEW COPIES OF THE DAMAGE CONTROL DIAGRAMS AND REVISED TEXT SHALL BE DELIVERED TO THE SHIP PRIOR TO DEPARTURE. TOGETHER WITH THE MASTER COPY BINDER. THREE SETS SHALL BE PROVIDED FOR SHIPS UNDER 220 FEET IN LENGTH AND FIVE SETS SHALL BE SUPPLIED FOR SHIPS OVER 220 FEET IN LENGTH. 079-20.33 DAMAGE CONTROL BOOKS SUBMARINES. DAMAGE CONTROL BOOKS PREPARED FOR SUBMARINES CONTAIN TEXT. TABLES. PLATES. AND DRAWINGS. THE TEXT DISCUSSES DAMAGE CONTROL AND ASSOCIATED PROBLEMS PECULIAR TO SUBMARINES. THE TABLES PRESENT FACTUAL DATA. AND THE PLATES AND DRAWINGS SUPPORT THE TEXT. THE PLATES ARE PREPARED IN BLACK AND WHITE. ONE COPY OF THE DAMAGE CONTROL BOOK SHALL BE MARKED SHIPS MASTER COPY AND SHALL BE KEPT CURRENT AS REQUIRED FOR SURFACE SHIPS. SEE PARAGRAPHS 079-20.26 THROUGH 079- 20.32. THE OVERHAULING ACTIVITY SHALL REVISE THE DAMAGE CONTROL BOOK TO REFLECT ALL CHANGES MADE DURING OVERHAUL. INCLUDING ANY CHANGES MADE BY SHIPS FORCE. AND REPRODUCE AND DISTRIBUTE IT IN ACCORDANCE WITH MIL-STD- 797. 079-20.34 REPORTING REQUIREMENTS. SUPERVISORS OF SHIPBUILDING AND COMMANDERS OF NAVAL SHIPYARDS SHOULD SUBMIT QUARTERLY REPORT NAVSEA 9664-1 ON NAVSEA FORM 9664/1 (FORMERLY NAVSEC 9880/1). STATUS OF DAMAGE CONTROL BOOK. TO THE COMMANDER. NAVAL SHIP ENGINEERING CENTER (NAVSEC). WITH COPIES TO NAVSEA. INDICATING ACTUAL AND ESTIMATED COMPLETION DATES FOR ALL DAMAGE CONTROL BOOK PROJECTS. NAVSEC FORM 9880/1 SHALL BE USED UNTIL THE SUPPLY OF THAT FORM IS DEPLETED. 079-20.35 MANUFACTURERS INSTRUCTION BOOKS. THIS VOLUME CONTAINS GENERAL INSTRUCTIONS FOR THE OPERATION. MAINTENANCE. AND REPAIR OF DAMAGE CONTROL AND FIREFIGHTING EQUIPMENT. ALL CONDITIONS CANNOT BE COVERED BECAUSE OF THE GREAT NUMBER OF MAKES. TYPES. AND DESIGNS OF EQUIPMENT ENCOUNTERED IN NAVAL SERVICE. FOR ALL BUT THE MOST SIMPLE TYPES OF EQUIPMENT. MANUFACTURERS INSTRUCTION BOOKS ARE SUPPLIED. THEY CONTAIN DETAILED INFORMATION CONCERNING THE OPERATION. MAINTENANCE. AND REPAIR OF THE SPECIFIC PIECE OF EQUIPMENT AND SHOULD BE STUDIED CAREFULLY BEFORE THE UNIT IS OPERATED OR SERVICED. SHOULD ANY CONFLICT EXIST BETWEEN THE INSTRUCTIONS GIVEN IN THIS VOLUME AND THE MANUFACTURERS INSTRUCTIONS. NAVSEA SHALL BE CONSULTED. 079-20.36 OTHER DAMAGE CONTROL REFERENCES. TABLE 079-3 LISTS PUBLICATIONS WHICH CONTAIN INFORMATION AND INSTRUCTIONS NECESSARY FOR KNOWLEDGE OF DAMAGE CONTROL PRACTICES AND PROCEDURES. TABLE 079-3. DAMAGE CONTROL REFERENCE PUBLICATIONS SECTION 21THE SHIP AND DAMAGE CONTROL 079-21.1DAMAGE CONTROL ORGANIZATION 079-21.2 THE PRIMARY DAMAGE CONTROL BATTLE ORGANIZATION UNIT IS THE REPAIR PARTY. CERTAIN REPAIR PARTIES MAY BE SUBDIVIDED. OR CERTAIN FUNCTIONS MAY BE THE JOINT RESPONSIBILITY OF TWO OR MORE REPAIR PARTIES. 079-21.3 INASMUCH AS THE ASSIGNMENT AND ORGANIZATION OF SHIP PERSONNEL TO DAMAGE CONTROL FUNCTIONS IS NOT A FUNCTION OF NAVSEA. IT IS SUGGESTED THAT CURRENT DIRECTIVES ISSUED BY PROPER AUTHORITY BE CONSULTED WHEN ORGANIZING OR REORGANIZING SHIP DAMAGE CONTROL PERSONNEL. THE DAMAGE CONTROL ORGANIZATION IN A SHIP SHALL CONFORM WITH THE RECOMMENDATIONS CONTAINED IN NWIP 50-3 AND SUCH OTHER DIRECTIVES ISSUED BY PROPER AUTHORITY. 079-21.4 IN CARRYING OUT THE PROVISIONS OF IMPLEMENTING DIRECTIVES. THE COMMANDING OFFICER. THROUGH THE EXECUTIVE OFFICER AND THE DAMAGE CONTROL ORGANIZATION. SHOULD IMPRESS UPON ALL PERSONNEL UNDER HIS COMMAND THE NECESSITY FOR OBTAINING THE HIGHEST DEGREE OF EFFICIENCY IN THE CONTROL OF DAMAGE THROUGH THOROUGH UNDERSTANDING AND APPLICATION OF DAMAGE CONTROL PRINCIPLES. 079-21.5 RESPONSIBILITY OF DAMAGE CONTROL OFFICER. RESPONSIBILITY OF THE DAMAGE CONTROL OFFICER INCLUDES THE EFFICIENT FUNCTIONING OF THE DAMAGE CONTROL ORGANIZATION. WATERTIGHT INTEGRITY. FIRE PREVENTION. MAINTENANCE OF CONDITION OF CLOSURE. AND DAMAGE CONTROL EQUIPMENT. 079-21.6 THE DAMAGE CONTROL OFFICER ALSO SHOULD INSURE THAT ALL DAMAGE CONTROL PERSONNEL RECEIVE TRAINING AND QUALIFY IN READING AND PROPERLY INTERPRETING DAMAGE CONTROL DIAGRAMS. BLUEPRINTS. DRAWINGS. AND OTHER SIMILAR MATERIAL CONCERNED WITH THEIR DUTIES. 079-21.7 RESPONSIBILITY OF DAMAGE CONTROL PERSONNEL. ALL OFFICERS AND MEN OF THE DAMAGE CONTROL

ORGANIZATION SHOULD OBTAIN A WORKING KNOWLEDGE OF THE ABILITY OF THE SHIP TO RESIST DAMAGE AND REMAIN AFLOAT. BY A THOROUGH STUDY OF THE SHIP AND ITS SYSTEMS. AND BY THE STUDY OF METHODS USED. BOTH SUCCESSFULLY AND UNSUCCESSFULLY. BY OTHER SHIPS IN COMBATTING DAMAGE.

079-21.8 EFFICIENCY. THE ENTIRE SHIPS COMPANY SHOULD BE TRAINED TO UNDERSTAND THE NECESSITY FOR MAINTENANCE OF THE HIGHEST DEGREE OF EFFICIENCY IN DAMAGE CONTROL. THIS SHOULD INCLUDE: PROPER SETTING OF MATERIAL CONDITIONS OF READINESS. AND PROPER OPERATION. USE. AND MAINTENANCE FOR DAMAGE CONTROL PURPOSES OF HULL AND ENGINEERING SYSTEMS: AND USE AND MAINTENANCE OF DAMAGE CONTROL MATERIAL AND EQUIPMENT. INCLUDING INTERIOR BATTLE COMMUNICATIONS. LOCATING DAMAGE. SUCH AS LEAKS. AND MAKING EMERGENCY REPAIRS UNDER ADVERSE CONDITIONS.

@ ESTABLISHING AND MAINTAINING A RIGID FIRE PREVENTION PROGRAM. AND KNOWING THE CAPABILITIES OF AVAILABLE EQUIPMENT AND THE CORRECT METHODS USED TO COMBAT ALL SHIP FIRES. COMBATTING ATTACK BY CHEMICAL. BIOLOGICAL, AND RADIOLOGICAL WARFARE AGENTS. GIVING FIRST AID TO INJURED PERSONNEL. WHEN DIRECTED TO DARKEN SHIP. CLOSING ALL DOORS. HATCHES. PORTS. AND OTHER FITTINGS WHICH ALLOW INTERIOR LIGHTS TO BE EXPOSED TO THE OUTSIDE. (TRAFFIC OF PERSONNEL FROM THE WEATHER TO THE INTERIOR MUST BE RESTRICTED TO ACCESS OPENINGS FITTED WITH LIGHT TRAPS OR DOOR SWITCHES.) 079-21.9 PERSONNEL SHOULD UNDERSTAND THAT THE SAME DEGREE OF EFFICIENCY IS AS NECESSARY UNDER IN-PORT CONDITIONS AS IT IS UNDER AT SEA CONDITIONS. 079-21.10 OVERLAPPING SKILLS. EACH MEMBER OF A REPAIR PARTY MUST BE A JACK-OF-ALL-TRA EACH MEMBER SHOULD LEARN TO DO ANY JOB THAT MAY BE REQUIRED OF ANY OTHER MEMBER. ELECTRICIANS MATES CAN LEARN TO SHORE. SHIPFITTERS TO HOOK UP THE CASUALTY POWER SYSTEM. AND DAMAGE CONTROLMEN TO PATCH PIPE LINES. ALL HANDS SHOULD LEARN HOW TO FIGHT FIRES AND TO APPLY FIRST AID. EVERY MAN MAY NOT BECOME AN EXPERT IN EVERY FIELD. BUT HE CAN AT LEAST BECOME A CAPABLE HELPER AND IN AN EMERGENCY. HIS ADDED ABILITY MAY BE NEEDED TO SAVE A SHIP. 079-21.11 TRAINING. IT IS NOT SUFFICIENT THAT PERSONNEL MERELY READ ABOUT HOW TO MAKE REPAIRS. STUDY PICTURES OF EQUIPMENT. OR DISCUSS METHODS. NOR IS IT ENOUGH THAT THEY HAVE ALL THE TOOLS AUTHORIZED BY THE SHIPS HULL ALLOWANCE LIST. OR THAT THEY MAKE ALL THE PREFABRICATED PATCHES AND TOOLS AS MAY BE SUGGESTED. ALL DAMAGE CONTROL PERSONNEL MUST KNOW HOW TO APPLY PRINCIPLES AND USE MATERIALS IN THE MOST EFFECTIVE WAY. THAT KNOWLEDGE CAN BE GAINED BY EDUCATION. TRAINING, AND ACTUAL PRACTICE. 079-21.12 AS EMPHASIZED IN PARAGRAPH 079-21.7. THOROUGH KNOWLEDGE OF THE SHIP IS OF PRIME IMPORTANCE. REPAIR PARTY PERSONNEL MUST KNOW THEIR OWN AREA. THEY ALSO MUST KNOW THE AREAS OF OTHER REPAIR PARTIES, IN CASE THEY HAVE TO MAKE REPAIRS OR ASSIST THOSE REPAIR PARTIES. PERSONNEL SHOULD BE EXCHANGED BETWEEN REPAIR PARTIES FROM TIME TO TIME. IN ORDER THAT THEY MAY TRAIN AND DRILL IN OTHER AREAS.

079-21.13 SIMULATING DAMAGE. TRAINING IN MAKING BATTLE REPAIRS IN SHIPS GENERALLY IS LIMITED BY CIRCUMSTANCES. OCCASIONALLY. THE NEED ARISES TO REPAIR A LEAKY PIPE OR TO RENEW A SMALL CABLE: BUT SELDOM IS THERE A CHANCE FOR THE AVERAGE MEMBER OF A REPAIR PARTY TO DO ANY REAL SHORING. TO STOP A LEAK IN THE HULL. OR TO GAIN EXPERIENCE IN ANY ASPECT OF DAMAGE CONTROL OUTSIDE HIS OWN SPECIALTY. THE MOST IMAGINATIVE AND ENERGETIC ORGANIZATION HAS TO PRETEND DAMAGE HAS OCCURRED. THERE IS NO WAY TO KNOW IF THE SIMULATED REPAIRS MADE WOULD BE EFFECTIVE UNDER THE PRESSURE AND VIBRATION INCIDENT TO BATTLE CONDITIONS. THE TEST COMES WHEN ACTUAL DAMAGE IS SUSTAINED. 079-21.14 TRAINING MOCK- UPS. FIGURES 079-102 AND 079-103 SHOW MOCK-UPS THAT CAN BE USED IN SHIPS FOR TRAINING MEN IN MAKING MANY OF THE SUGGESTED REPAIRS. SMALL GROUPS SHOULD BE DETAILED FOR INSTRUCTION ON THESE MOCK-UPS EACH DAY. WHILE THESE MOCK-UPS ARE FAR SHORT OF ACTUAL BATTLE DAMAGE. THEY WILL GIVE THE MEN GOOD PRACTICE IN USING THEIR HANDS, AND AN OPPORTUNITY TO STUDY BETTER METHODS AND SHORT CUTS FOR MAKING REPAIRS. THE USE OF WATER PRESSURE NOT ONLY MAKES THE INSTRUCTION MORE INTERESTING BUT WILL CONVINCE ALL HANDS OF THEIR NEED OF PRACTICE. FIGURE 079-102. BULKHEAD TRAINING MOCK-UP FIGURE 079-103. PIPING TRAINING MOCK-UP 079-21.15 READING

DIAGRAMS AND DRAWINGS. A THOROUGH UNDERSTANDING OF HOW TO READ AND INTERPRET DIAGRAMS AND DRAWINGS. PARTICULARLY ISOMETRIC AND ORTHOGRAPHIC (MECHANICAL) DRAWINGS. IS ESSENTIAL FOR ALL PERSONNEL IN THE DAMAGE CONTROL ORGANIZATION. DAMAGE CONTROL PERSONNEL ALSO SHOULD HAVE AN UNDERSTANDING OF NAVY SYSTEMS FOR FILING AND STORING BLUEPRINTS AND DRAWINGS. 079-21.16 INSPECTION SCHEDULES 079-21.17 THE COMMANDING OFFICER. THROUGH THE DAMAGE CONTROL OFFICER. SHALL PROVIDE FOR AND ENFORCE REGULAR SCHEDULES OF INSPECTION, MAINTENANCE. REPAIR. AND REPLACEMENT TO INSURE WATERTIGHT INTEGRITY. PROPER OPERATION OF HULL AND ENGINEERING SYSTEMS FOR DAMAGE CONTROL. AND PROPER OPERATION OF ALL DAMAGE CONTROL EQUIPMENT AND MATERIALS. A MORE DETAILED DISCUSSION OF DAMAGE CONTROL INSPECTIONS AND TESTS IS INCLUDED IN SECTION 23.

INSTRUCTIONAL PASSAGES

ARMY 'NEW LOOK' MANUAL. PERSHING MISSILE SYSTEM PROCEDURAL MANUAL

Don't work on electronic equipment unless someone else is near who knows about the operation and hazards of this equipment. He should also know how to give first aid. If you have a helper, make sure he knows what items are dangerous. Whenever you can, shut off power to the equipment before you start to work on it. Ground every capacitor that is likely to be dangerous. When you are working inside the equipment, and after you have turned off power, ground every part before you touch it. Do not touch high-voltage connections when you install or operate this equipment. Don't be fooled by the term 'low voltage'. You could be killed by as little as 50 volts! Whenever you can, keep one hand away from equipment to reduce the chances of current flowing through vital organs of your body. Read FM 21-11 so you'll know about artificial respiration.

Panel lamps - provide panel lighting. Panel lamps switch - turns panel lamps on and off. Reverse phase lamp - indicates improper phase of ac power from ac generator set 2. Gen no. 1 on lamp - indicates that power is available from ac generator set 1. Gen no. 2 on lamp - indicates that power is available from ac generator set 2. Vent door bypass switch - not used (for maintenance purposes only at a higher level of maintenance). Overvolt lamp - indicates that output voltage from motor generator set 2 is too high. Power on lamp - indicates that motor generator set 2 power is available. Generator on switch - makes output of motor generator set 2 available for distribution. Generator off switch - removes output of motor generator set 2. Motor stop switch - stops motor generator set 2 drive motor. Motor start switch - starts motor generator set 2 drive motor. Voltage increase control - adjusts output voltage from motor generator set 2. Voltmeter - indicates dc output voltage from motor generator set 2.

INSTRUCTIONAL PASSAGES

NAVPERS 15665C 1104.2.4.5.. 1106.1.. AND 1106.2

The Commandant of each Naval District is assigned the responsability for establishing and controlling uniform policies within the geographical limits of his District. He shall prescribe uniforms for the season. day or special occasion for all Naval personnel (including Marines under his command) which will provide the greatest uniformity. Personnel of all Naval Activities domiciled within the District shall wear only those uniforms prescribed for personnel assigned to the District. The Commandant may designate sub-areas and assign area coordinators/se officers present authority to prescribe local uniforms which are compatible with mission and climate. Senior officers present afloat in district waters shall insofar as practicable. follow the uniforms prescribed by the Commandant with regard to liberty parties and members of the command operating ashore. Uniform selections are to be at the discretion of the prescribing authority and not optional to the individual. Local Uniform Regulations shall be promulgated by each Commandant. Area Commander. SOPA or other designated authority utilizing the format provided in the sample instruction appended to this chapter. Uniforms for daily wear are equivalent to civilian business attire and prescribed for normal executive office work. watchstanding. liberty and official business ashore. Service Dress uniforms are normally prescribed as the uniform of the day.

Working uniforms are prescribed for working situations which would unduly soil dress uniforms or dress uniforms would be inconvenient or unsafe. Working uniforms are prescribed as the uniform of the day aboard ship when at sea and are usually permitted for shipboard personnel in port during normal working hours. They may also be worn at shore stations during normal working hours. in industrial areas. and when otherwise deemed appropriate by the Senior Officer Present. Work uniforms normally are not authorized for wear off naval establishments.

INSTRUCTIONAL PASSAGES

NAVAIR 01-40 AVM-2-7.2, PARAGRAPHS 4.5 TO 4.7

A maintenance assurance inspection is required for all maintenance procedures that, if improperly performed, could cause equipment failure or jeopardize ground personnel. An underlined procedural step indicates that a maintenance assurance inspection shall be performed prior to proceeding to the next step. A Maintenance Assurance Summary at the end of a procedure lists the maintenance assurance inspections that shall be performed after completion of the procedure. Clean all parts of the bench test set adapter before and after use to remove dirt, dust, oil, grease, and corrosion-produ matter. Wipe surfaces clean with a soft, clean cloth dampened in aliphatic naphtha (TT-N-95). Remove dirt, oil, and grease from the electrical receptacle and connectors with a small, nonmetallic, firm bristle brush moistened with aliphatic naphtha, and dry thoroughly with dry air or soft, clean cloth. After cleaning, apply antiseize compound (TT-A-580) sparingly to the threaded portion of the receptacle. Inspect all parts of the adapter assembly for corrosion, wear, and damage. Check mechanical action of toggle switches and tone generator switch for proper detents. Check continuity of fuses and light with ohmmeter. Examine light assembly lens for cracks. Inspect earphones jack for corrosion and bent contacts. Inspect fuses, fuse holders, and extractor posts for corrosion and damage. Inspect electrical receptacle and connectors for corrosion, security of solder connections, and condition of pins. Inspect all wiring for condition of insulation.

INSTRUCTIONAL PASSAGES

NAVSEA S9086-CN-STM-00/CH 079 PARAGRAPHS 21.4, 21.11, AND 21.13

In carrying out the provision of implementing directives, the Commanding Officer, through the Executive Officer and the damage control organization, should impress upon all personnel under his command the necessity for obtaining the highest degree of efficiency in the control of damage through thorough understanding and application of damage control principle. It is not sufficient that personnel merely read about how to make repairs, study pictures of equipment, or discuss methods. Nor is it enough that they have all tools authorized by the Ship's Hull Allowance List, or that they make all the prefabricated patches and tools as may be suggested. All damage control personnel must know how to apply principles and use materials in the most effective way. That knowledge can be gained by education, training, and actual practice. Training in making battle repairs in ships generally is limited by circumstances. Occasionally, the need arises to repair a leaky pipe or to renew a small cable; but seldom is there a chance for the average member of a repair party to do any real shoring, to stop a leak in the hull, or to gain experience in any aspect of damage control outside his own specialty. The most imaginative and energetic organization has to pretend damage has occurred. There is no way to know if the simulated repairs made would be effective under the pressure and vibration incident to battle conditions. The test comes when actual damage is sustained.

INSTRUCTIONAL PASSAGES

NAVAIR 01-40 AVM-2-7.2 PARAGRAPHS 1-11.. 1-12.. AND 1-33

The theory of operation text for the system explains how the system performs its functions by utilizing the capabilities of its related circuitry and components. The text is supported by diagrams. charts. and illustrations to assist the user of the manual. Operating instructions for the system include the identification and location of controls. switches. instruments. indicators. and lights as they appear in the aircraft. Instructions are given in normal sequence for activating the system. and all the resulting indications that the system is operating satisfactorily are defined. Subsequent to the publication of the initial issue of the A-4M Technical Manual Maintenance Instructions. changes in the aircraft and equipment. in support concepts and in procedures. as well as additional information developed by experience. affect the contents of the manual.

INSTRUCTIONAL PASSAGES

NAVAIR 05-35 EAC-1 TABLE 3-2

Attach to top and bottom surfaces of the test set computer to allow the test set computer to be placed on any side surface during maintenance. Used to lift signal converter. Used to remove card assemblies. Gages torque, within the range of 6 to 100 ounce-inches. applied to screws of replacement assemblies. Gages torque. within the range of 2 to 30 pound-inches, applied to screws of replacement assemblies. Adapts torque screwdrivers to no. 2 through no.4 Phillips screws. Adapts torque screwdrivers to no. 4 slotted screws. Adapts torque screwdrivers to Allen screwdriver bits of screwdriver set (index number 11). and nutdriver/screw set (index number 12). Hand tools which fit slotted screws and Phillips screws of replacement assemblies. Hand tools which fit nuts of replacement assemblies. Used with torque screwdrivers on Allen screws of replacement assemblies. Used with torque screwdrivers on Phillips screws. slotted screws. and nuts of replacement assemblies. Gages torque. within the range of 0 to 200 pound-inches. applied to jam nuts of replacement assemblies. Used to remove and replace test set switches. Used to remove and replace jamnuts of test set computer malfunction indicators and reset switch.

Adapts 3/8-inch drive torque wrench to sockets with 1/2-inch drives. Used to remove and replace connector jamnuts of cable. harness. and back panel assemblies from their respective mounting surfaces. Used to insert the roll pin of test set computer page assembly jackscrews. Used to removed and insert the roll pin of the test set computer mounting bolts. Used to make contact with test points on page assembly A6 during strobe pulse adjustment.

INSTRUCTIONAL PASSAGES

NAVAIR 05-35 EAC-1 PARAGRAPHS 4-6 THROUGH 4-8

The tactical computer set solves a navigation function five times a second and a weapon delivery function 25 times a second. when required. The operating mode of the tactical computer set is determined by an external master function switch. The results of the computations can be displayed by the tactical computer control and/or by the interface components having displayed capabilities such as the head-up display, etc. The pilot monitors the displays to steer the aircraft to a desired destination or target. The tactical computer performs the arithmetic and logical computations required to solve navigation and weapons delivery functions. The tactical computer operates under control of the self-contained program to accept and retain data from the tactical computer control and the external equipment until needed. The tactical computer executes the operations directed by the program to solve the functions required using externally supplied data and previously stored data as necessary. The results of the computations are transmitted as display data or discrete commands to the tactical computer control or external equipment. Data is transmitted to and from the tactical computer as either serial digital signals or analog signals. The tactical computer modifies the interface signals as necessary to provide a compatible signal interface with the external equipment. Power application to the electronic circuits of the tactical computer set is controlled by the COMPUTER toggle switch on the tactical computer control. The tactical computer control will also control power application to the Loran equipment (growth item) and enable the pilot to select the Loran oprating mode. Built-in tests of the tactical computer set are also activated by the COMPUTER toggle switch on the tactical computer control.

PROCEDURAL TEST PASSAGES

NAVAIR 01-245 FDN-2-8.5. PARAGRAPHS 3-419 AND 3-422

Procedure. Open radome and extend radar package per figure 3-2. a. Is el strobe positioned correctly on one indicator? b. Adjust RO or PILOT A GUN V CENT. Is malfunction corrected? c. Replace A3720 (aft) or A3719 (fwd) for correct indication. d. Rotate elevation control. Does elevation strobe move? e. Replace control-power supply per paragraph 3-910. f. Place POWER to TEST and TEST to 2. Does elevation strobe position to +40 elevation. g. Does elevation strobe move. h. Does antenna vernier indicate +40 +2 elevation? i. Is 13.84Vac present at TP4920? j. Remove hydraulic power. Pin antenna at BST. Adjust B6215. k. Perform antenna hydraulic balance. Can balance be performed? l. Replace antenna per paragraph 3-873. m. Is malfunction corrected? n. Is elevation strobe within +2 of 40 ? o. Replace roll and climb assembly per paragraph 3-913. p. Place TEST to 0 and POWER to STBY. Adjust EL STROBE CENT ADJ to position elevation strobe at zero. Is malfunction corrected? q. Replace the indicator control unit per paragraph 3-940.

Procedure. Open radome and extend radar package per figure 3-2. a. Place POWER to TEST: MODE to MAP: TEST to 2. Does B-sweep position to 20 right and elevation strobe to 40 up? b. Replace control-power supply per paragraph 3-910 or K4807. c. Replace radar set control per paragraph 3-969.

PROCEDURAL TEST PASSAGES

NAVAIR 01-245 FDN-2-8.5. PARAGRAPH 3-670

Procedure. Open radome and extend package per figure 3-2. a. Is GYRO IN light (TS-1828D/A) illuminated? b. Short 1J3/22 to ground. Does GYRO IN light illuminate? c. Replace 1A3 platter. d. Does continuity exist between 1J5/M and 1J3/22? e. Does continuity exist between 1P5/M and 3P1/w? f. Repair AMCS package wiring. g. Does continuity exist between 3J1/w and 3J2/x? h. Replace radar modular per paragraph 3-994. i. Repair wiring between 73P414/x(3P2 and 73P404/AB(AMCS test panel). j. Does continuity exist between 1J3/53 and 73P404/w? k. Repair aircraft wiring between 1J3/53 and 73J404/w.

Procedure. Open radome and extend radar package per figure 3-2. a. Is malfunction common to all stations? b. Is malfunction at wing station? c. Is malfunction common to all fuselage stations? d. Press warning lights test switch (fwd cockpit). Does SELECTED light illuminate? e. Replace SELECTED light(s) bulb. for station connected? Does SELECTED light illuminate? f. Replace missile status panel per paragraph 3-959. Does SELECTED light illuminate? g. Repair wiring from missile firing relay panel to missile status panel. Refer to NAVAIR 01-245FDN-2-10. h. Check continuity of applicable wiring. Does continuity exist? i. Repair wiring. j. Replace tuning drive per paragraph 3-1030. Does SELECTED light illuminated? k. Check continuity of applicable wiring from 62P416A to 63P355A (missile firing relay panel assembly). Does continuity exist? l. Is malfunction at fwd station? m. Replace missile firing relay panel assembly per paragraph 3-956. n. Check continuity for applicable station.

PROCEDURAL TEST PASSAGES

NAVAIR 01-245 FDN-2-8.5. PARAGRAPH 3-1171

Error Detector Balance. Back Bias. a. Position control as follows. b. Connect test cable between A303J2 on AN/APM130 and J114. Place S2206, on the synchrnizer, to TEST and press S2205. Rotate R2226 to its midrange position. c. Connect test probe from METER IN to ERROR DET OUT A3003/TP6. d. Connect TP2209 to ground. e. Observe meter while RDR RCVR ST and press S2205. Rotate R2226 to its midrange position. c. Connect test probe from METER IN to ERROR DET OUT A3003/TP6. d. Connect TP2209 to ground. e. Observe meter while RDR RCVR gain is increased, adjust DL2207 to 0.01-usec steps to increase time delay. g. Repeat step f until change in voltage at A3003/TP6 is less than 0.004Vdc as RDR RCVR GAIN is alternately rotated from ccw to cw position. h. Remove meter lead from A3003/TP6. i. Position AN/APM-130 controls as follows. j. Place TEST (ARSC) to 1 and S2206 to OPERATE. Lock on 2 target. k. Adjust FREQUENCY & NULL REFERENCE dial to produce a null on meter with VOLTAGE SCALE at 0.30. l. Place POWER (RSC)to STBY. Observe meter for drift of range voltage. Range voltage does not change more than 0.060Vdc before system unlocks. If voltage change is greater than 0.060Vdc, adjust B.B. BAL A3003/R39 to correct for drift. m. Repeat steps j, k and l until range voltage draft is as close to zero as possible. but less than 0.060Vdc.

PROCEDURAL TEST PASSAGES

NAVAIR 01-245 FDN-2-8.5. PARAGRAPHS 3-920 THROUGH 3-926

Removal. a. Place both generator control switches to OFF. b. Disconnect two air lines from aft end of unit. c. Loosen wing nut on clamp until clamp can be released. Released clamps. Slide unit out of clamp and remove from aircraft. Installation. a. Place both generator control switches to OFF. b. Place unit in clamp with air connections aft. c. Latch clamp (loosen wing nut if necessary) and tighten wing nut finger-tight. d. Connect and tighten two air lines to unit. e. Perform checks required per table 3-14. DISTRIBUTION BOX. The distribution box is located in the aft cockpit, mounted on the underside of the shelf that mounts the stabilization data generator forward and below the right console. Removal. CAUTION Exercise care during replacement of distribution box to prevent damage to fuel drain lines. a. Place both generator control switches to OFF. b. Remove stabilization data generator. c. Disconnect elctrical connector. d. Hold unit and remove four mounting screws. e. Remove unit from aircraft. Installation. a. Place both generator control switches to OFF. b. Inspect electrical connector for damage and corrosion and wiring for chafing, fraying and security of harness. (Quality Assurance) c. Hold unit in mounting position and install four mounting screws. d. Connect electrical connector. e. Install stabilization data generator. f. Performed checks required per table 3-14. ELECTRICAL SYNCHRONIZER. The synchronizer is located in the nose equipment compartment mounted on the left side forward end of the electrical equipment rack and is accessible with the radome open and the radar package extended. Removal. a. Open radome and extend AMCS radar package per figure 3-2. b. Disconnect P2201. P2202. P2203. P2204, P2205 and P2206 from underside of unit. c. Loosen two bolts on the clamps at bottom of unit that attach to hinge bar. d. Hold unit in position and loosen two bolts at top of unit securing unit to electrical equipment rack. e. Lower unit to end of safety cable travel. hold unit. release safety cable and lift unit off hinge bar.

PROCEDURAL TEST PASSAGES

NAVAIR 01-245 FDN-2-8.5. PARAGRAPH 3-1175

Five-second Unlock Time Delay. a. Position controls as follows. b. Lock on any target, and allow 5 seconds for system to stabilize. c. Place TEST (ARSC) to 0 and measure time required for system to unlock as indicated by indicator display returning to search. Time delay is 5+1 seconds. Check target detector balance (refer to paragraph 3-1170). If balance is satisfactory, adjust A3001/R12 so time delay is 5+1 seconds.

PROCEDURAL TEST PASSAGES

NAVAIR 05-35 EAC-1 PARAGRAPH 7-103

To remove blower B1 (4, figure 7-9) from the tactical computer proceed as follows: WARNING Make certain power is removed from the tactical computer prior to removing the blower. a. Slide rubber shroud up harness (18) and remove three screw-mounted terminal clips from blower: retain screws and washers for reassembly. b. Remove three screw-hole plugs (6) from front of blower. c. While supporting blower with one hand, remove three socket-head mounting screws (5) and lift blower from tactical computer; retain screws and gasket (7) for reassembly. NOTE Disassemble blower only to the extent required for replacement or repair of defective components. d. Remove air inlet ring cover (4B). e. Loosen two hex socket setscrews on impeller (4C) sufficiently for removal of impeller from shaft of motor assembly. f. Remove impeller. g. Remove impeller blower housing (4D) from motor assembly (4F) by removing four machine screws (4E) and retain screws for reassembly.

PROCEDURAL TEST PASSAGES

NAVAIR 05-35 EAC-1 PARAGRAPH 7-109

To remove main store array assembly A9 (1, figure 7-10) from the tactical computer, proceed as follows: NOTE The tactical computer must be removed from the test set prior to removing the main store array assembly. a. Remove left cover (2) by removing 28 mounting screws (3, figure 7-9). b. Remove four array assembly mounting screws (2, figure 7-10) and four associated fiber washers (4). CAUTION Array assembly Allen jackscrews located on lower mounting flanges must be alternately loosened two turns at a time, to prevent damage to array assembly. As array assembly Allen jackscrews are loosened, washers (3) become freed. Observe that washers do not become misplaced. NOTE Allen screwdriver set is supplied with the test set special tools. c. Alternately loosen four array assembly Allen jackscrews located on lower mounting flanges, two turns at a time, until array assembly is disengaged from frame. d. Carefully lift array assembly from frame.

PROCEDURAL TEST PASSAGES

NAVAIR 05-35 EAC-1 PARAGRAPH 8-22

To remove display assembly A3 (22. figure 8-3) from the tactical computer control. proceed as follows: a. Remove two knobs (2 and 3. figure 8-2) by loosening three setscrews. b. Remove four screws (4). two screws (5) and associated washers (6) and rubber grommets (7). c. Gently pry the lighting panel (14) from control to disengage connector: then. remove lighting panel. d. Remove right cover (15) by removing 12 screws (16). e. Remove seven screws (2. figure 8-3) and one screw (3): then. carefully pull out front panel assembly (1) to gain access to interior of control. f. Remove 4 screws (23. figure 8-3) that secure the 15 lamp segment of the display assembly to the front panel.

PROCEDURAL TEST PASSAGES

NAVAIR 05-35 EAC-1 PARAGRAPH 8-25

To remove rf filters FL1 through FL4 (26 and 27. figure 8-3) from the tactical computer . proceed as follows: a. Remove left and right covers (15, figure 8-2) by removing 24 screws (16). CAUTION Page assembly jackscrews must be alternately loosened. three turns at a time. to prevent damage to alignment pins and page assembly frame. b. Remove two page assemblies (20 and 21. figure 8-3) by alternately loosening four page assembly jackscrews, three turns at a time. until page assemblies are disengaged from frame: carefully lift page assemblies from frame. c. Dismount cable receptacle 2J1 from rear panel by removing four screws (15) and nuts (19). NOTE Filters FL1 through FL4 are mounted in respective order. top to bottom. d. Tag and unsolder lead from left side of defective rf filter. e. Remove two bracket mounting screws (29). f. Move bracket (28) to right side opening as far as cabling permits: then. tag and unsolder lead from right side of defective rf filter. g. Dismount defective rf filter from bracket by removing nut and washer.

REFERENCES FOR PROCEDURAL AND INSTRUCTIONAL TEST PASSAGES

NAVAIR 01-40 AVM-27.2. Maintenance Instructions (Organizational and Intermediate) Navy Model A-4M Air Craft AH/APG-53A Radar System. 15 May 1973. Naval Air Systems Command.

NAVAIR 01-245 FDN-2-8.5. Maintenance Instructions (Organizational) Naval Model F-4N Aircraft AERO 1A(NX-4) Maintenance Procedures. 15 October 1972. Naval Air Systems Command.

NAVAIR 05-35 EAC-1. Maintenance Instructions (Intermediate) Tactical Computer Set AN/ASN-92(V). 1 March 1972. Naval Air Systems Command.

NAVAIR 01-245-FDF-2-4.16. Radar Set AN/APG-59R System Configuration. December 1978. Naval Air Systems Command.

TM 9-1450-383-10. Operator's Technical Manual, Trailer Mounted Guided Missile System Power Station Group OA-6793 (XO-30)/MJQ-3. June 1978. Headquarters, Department of the Army.

NAVPERS 15665C. United States Navy Uniform Regulations. 1978. Bureau of Naval Personnel.

REFERENCES FOR NAVSEA TEST PASSAGES

NAVSEA S9086-BH-STM-000/CH 041. Administration of Funds. 1 March 1976. Change, 1 November 1977. Naval Sea Systems Command.

NAVSEA S9086-CN-STM-030/CH 079. Damage Control-Engineering Casualty Control. Vol 3, 1 October 1977. Change, 1 July 1978. Naval Sea Systems Command.

NAVSEA S9086-CN-STM-020/CH 079. Practical Damage Control. Vol 2, 1 July 1977. Change, 30 April 1979. Naval Sea Systems Command.

NAVSEA S9086-CN-STM-010/CH 079. Damage Control Stability and Buoyancy. Vol 1, 15 August 1976. Change, 1 November 1977. Naval Sea Systems Command.

NAVSEA S9086-Q5-STM-000/CH 491. Electrical Measuring and Test Instruments 1 August 1976. Change, November 1977. Naval Sea Systems Command.

NAVSEA S9086-MD-STM-000/CH 400. Electronics. 1 June 1976. Change, 1 November 1977. Naval Sea Systems Command.

NAVSEA S9086-CZ-STM-000/CH 090. Inspections, Tests, Records, and Reports. 15 February 1977. Change, 15 December 1977. Naval Sea Systems Command.

NAVSEA S9086-K9-STM-000/CH 330. Lighting. 1 June 1977. Change, 15 May 1979. Naval Sea Systems Command.

REFERENCES FOR NAVSEA TEST PASSAGES (continued)

NAVSEA S9086-WK-STM-000/CH 670. Storage, Handling and Disposal of Hazardous General Use Consumables. 1 August 1978. Change, 1 February 1979. Naval Sea Systems Command.

APPENDIX G

HOW TO USE TAEGs COMPUTER READABILITY EDITING SYSTEM

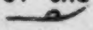
To use TAEGs Computer Readability Editing System, an author would key into the computer a sample of text such as that shown in figure G-1, which is the author's writing before any computer editing has been done. To find out whether Navy personnel will be able to read this writing, and to receive suggestions on how to make it more readable, the sample of text is processed by the computer. Figure G-2 is a computer printout containing the output of the editing system.

The output in figure G-2 consists of the text with suggested changes as well as Notes, Readability Results, and Words Not on Basic List. The single most important indicator of text readability is Grade Level, listed under Readability Results. This measure is computed by the Flesch-Kincaid Reading Ease Formula. Also found under Readability Results is the information that the formula uses to compute the grade level--average number of words per sentence and average number of syllables per word. In this example, the grade level is 16.6. If the intended readers have an average reading grade level below this level, the author should try to reduce the reading grade level. This will most certainly be the case here, since the average reading level for Navy enlisted personnel is about the 10th grade.

Specific suggestions on how to reduce the grade level are found in other features of the editing system. One of these is the flagging of uncommon words. Within the text of figure G-2, all uncommon words have been enclosed in parentheses. These same words are listed with their frequencies of occurrence under Words Not on Basic List at the bottom of the printout. The uncommon words are words that are not on the Common Word List; they are words with which most readers are not familiar. To make the text more readable, the author should try to replace these words with simpler words; if that is not possible, then the author should consider defining the word, either in context or in a glossary.

The word-substitution feature of the editing system has placed in brackets all words recommended for replacement. These are words for which specific substitutes are recommended. The brackets are shown in the text of figure G-2. Each word in brackets is followed by its proposed substitute(s) in brackets and in capital letters. The author should decide whether to use one of these substitutes or to retain the original word. In most cases, one of the substitutes will help to improve the readability of the text.

Sentences that are too long have been flagged with a number between slash marks following each such sentence. Under Notes, this number appears again with information on the amount of words in the sentence. The author should try to rewrite such sentences so as to make them shorter.

Figure G-3 shows how the text is rewritten using the suggestions of the editing system. The author uses proofreading symbols to indicate corrections to be made on the editing system output. Many of the uncommon words in parentheses have been deleted as shown by the  through them. Some of these have been replaced with simpler words; for example, "housed" for "domiciled." Other uncommon words have only been deleted, such as "geographical." Several uncommon words have been retained and were not marked; for example, "sub-areas." There is no more suitable replacement for this word. In every case the author makes a final decision on the suggestions made by the editing system.

The author's response to the sentence length flagged by the editing system might influence the choice of words described above. The first sentence of figure G-3 is flagged with /1/, and under notes the /1/ indicates 23 words in the sentence. The author has responded by deleting several words from the sentence. The author's response to the long sentence, marked by note /5/, has been to divide it into two sentences. Throughout the editing process, the author's judgment plays a critical role, especially in rewriting long sentences. Throughout figure G-3, examples of human judgment in editing can be seen. However, the need for the CRES is shown by the suggestions in the edited text which guide the author by pointing out problems that the human editor might not have seen.

The next step in the editing process is to analyze the edited product of figure G-3 using the computer editing program again. This step checks the results of the first editing. Figure G-4 shows the output of the editing system after analyzing the edited text of figure G-3. The average number of words per sentence has been reduced from 22.66 to 15.38, while the average number of syllables per word has been reduced slightly. As a result, the grade level of the text has been reduced from 16.6 to 11.2, a reading level much closer to the skill of Navy personnel. The number of uncommon words has been reduced from 13 to 2. These two words are uncommon but the author considered them essential to the meaning of the text.

The final product appearing in figure G-5 resulted through the combination of the analysis of the CRES plus the author's acting on the suggested changes. The result in figure G-5 is a much more readable sample of text than the original version of figure G-1. A comparison of the text in the two figures clearly points this out.

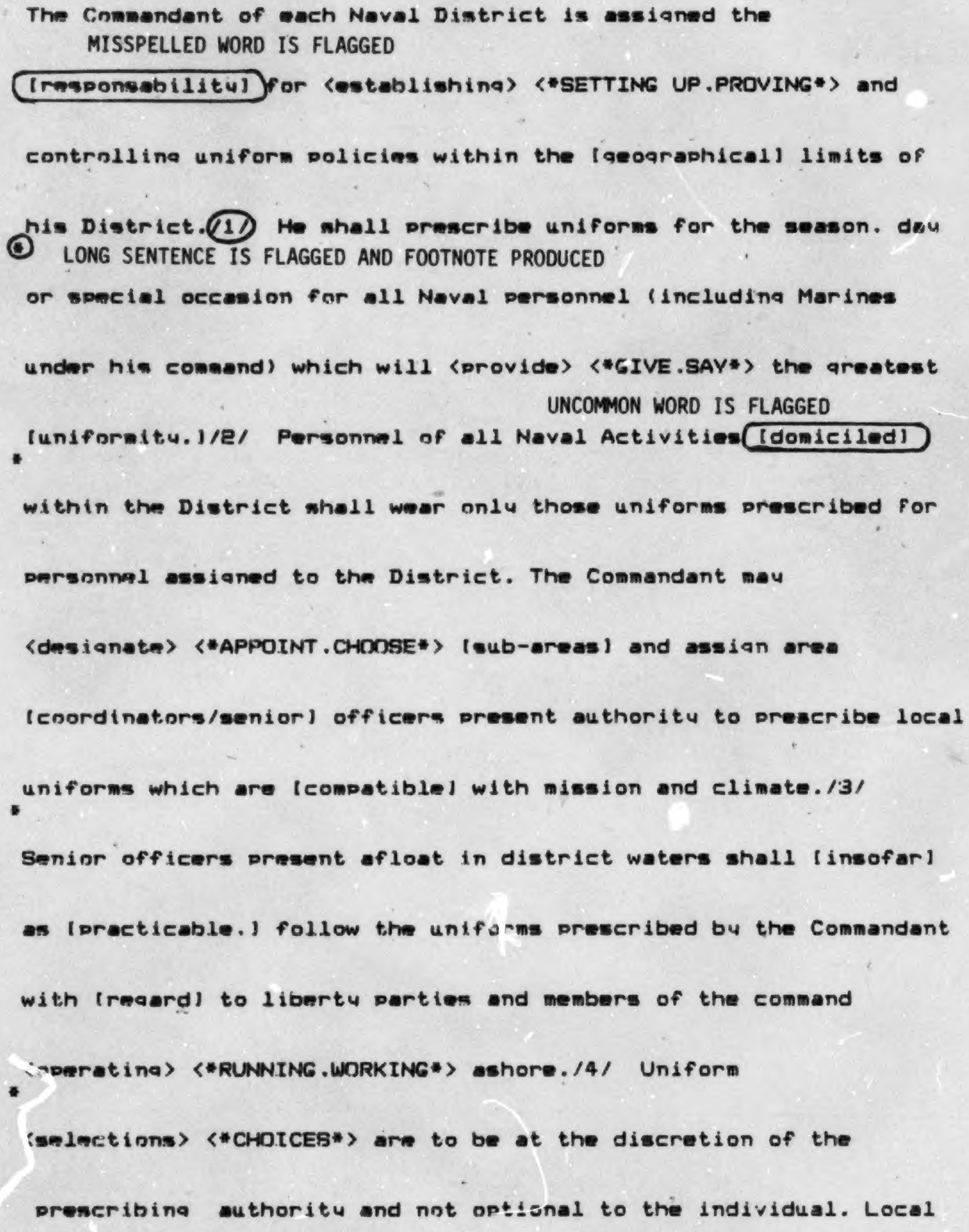
The Commandant of each Naval district is assigned the responsability for establishing and controlling uniform policies within the geographical limits of his district. He shall prescribe uniforms for the season, day, or special occasion for all Naval personnel (including Marines under his command) which will provide the greatest uniformity. Personnel of all Naval activities domiciled within the district shall wear only those uniforms prescribed for personnel assigned to the district. The Commandant may designate sub-areas and assign area coordinators/senior officers present authority to prescribe local uniforms which are compatible with mission and climate. Senior officers presently afloat in district waters shall, insofar as practicable, follow the uniforms prescribed by the Commandant with regard to liberty parties and members of the command operating ashore.

Uniform selections are to be at the discretion of the prescribing authority and not optional to the individual.

Local uniform regulations shall be promulgated by each Commandant, area Commander, SOPA, or other designated authority utilizing the format provided in the sample instruction appended to this chapter.

Uniforms for daily wear are equivalent to civilian business attire and are prescribed for normal executive office work, watchstanding, liberty, and official business ashore. Service dress uniforms are normally prescribed as the uniform of the day.

Figure G-1. Sample of Text Taken from the Navy's Uniform Policy Regulations (NAVPERS 15665C, 1978) Before Processing by TAEGs Computer Readability Editing System. (Readability is at the College Graduate Level.)


MISSPELLED WORD IS FLAGGED
LONG SENTENCE IS FLAGGED AND FOOTNOTE PRODUCED
UNCOMMON WORD IS FLAGGED

```
The Commandant of each Naval District is assigned the
[responsability] for <establishing> <*SETTING UP.PROVING*> and
controlling uniform policies within the [geographical] limits of
his District./1/ He shall prescribe uniforms for the season. day
*
or special occasion for all Naval personnel (including Marines
under his command) which will <provide> <*GIVE.SAY*> the greatest
[uniformity.]/2/  Personnel of all Naval Activities [domiciled]
*
within the District shall wear only those uniforms prescribed for
personnel assigned to the District. The Commandant may
<designate> <*APPOINT.CHOOSE*> [sub-areas] and assign area
[coordinators/senior] officers present authority to prescribe local
uniforms which are [compatible] with mission and climate./3/
*
Senior officers present afloat in district waters shall [insofar]
as [practicable.] follow the uniforms prescribed by the Commandant
with [regard] to liberty parties and members of the command
<operating> <*RUNNING.WORKING*> ashore./4/  Uniform
*
<selections> <*CHOICES*> are to be at the discretion of the
prescribing  authority and not optional to the individual. Local
```

Figure G-2. Same Sample of Text After Computer Processing. Various Features of the System are Annotated.

```
                       TWO EASIER SUBSTITUTES ARE OFFERED FOR DIFFICULT WORD
Uniform Regulations shall be <promulgated> <*ANNOUNCED.ISSUED*> by

each Commandant. Area Commander. SOPA or other

<designated> <*APPOINTED.CHOSE/CHOSEN*> authority

<utilizing> <*USING*> the format <provided> <*GAVE/GIVEN.SAID*> in

the sample instruction [appended] to this chapter./5/  Uniforms for
*
daily wear are <equivalent> <*EQUAL*> to civilian business [attire]

and prescribed for normal executive office work. [watchstanding.]

liberty and official business ashore./6/  Service Dress uniforms
*

are normally prescribed as the uniform of the day.


-----------------------------NOTES-----------------------------------
/  1/  This sentence contains 23 words - consider shortening it.
/  2/  This sentence contains 26 words - consider shortening it.
/  3/  This sentence contains 23 words - consider shortening it.
/  4/  This sentence contains 30 words - consider shortening it.
/  5/  This sentence contains 28 words - consider shortening it.
/  6/  This sentence contains 23 words - consider shortening it.


------------------    READABILITY RESULTS     ---------------------

Number of Sentences      Number of Words      Number of Syllables
         9                     204                    404
```

Figure G-2. Same Sample of Text After Computer Processing. Various Features of the System are Annotated (continued)

```
Avg. Number of Words per Sentence      Avg. Number of Syllables per Word
              22.66                                    1.98

GRADE LEVEL   (Based on DOD Readability Standard)
      16.6   FLESCH-KINCAID READABILITY GRADE LEVEL IS INDICATED
------------------   WORDS NOT ON BASIC LIST   ----------------------
           UNCOMMON WORDS AND THEIR FREQUENCY OF EACH ARE INDICATED
WORD                       FREQ        WORD                     FREQ

appended                    1         attire                     1
compatible                  1         coordinators/sen           1
domiciled                   1         geographical               1
insofar                     1         practicable                1
                                      regard                     1
responsability              1         sub-areas                  1
uniformity                  1         watchstanding              1
```

Figure G-2. Same Sample of Text After Computer Processing. Various Features of the System are Annotated (continued)

The Commandant of each Naval District is assigned the

p
[responsability] for ~~<establishing>~~ <*SETTING UP~~,PROVING*~~> and

controlling uniform policies within ~~the [geographical] limits of~~

his District./1/ He shall prescribe uniforms for the season, day
*

and Marine
or special occasion for all Naval personnel ~~(including Marines)~~

be most uniform.
~~under his command)~~ which will ~~<provide> (*GIVE.SAY*) the greatest~~

housed
~~[uniformity]~~]/2/ Personnel of all Naval Activities ~~[domiciled]~~
*

within the District shall wear only those uniforms prescribed for

~~personnel assigned to~~ the District. The Commandant may

He may also
~~<designate> (*APPOINT~~.CHOOSE*> [sub-areas ~~and~~ assign area

[coordinators/senior] officers present) authority to prescribe local

meet needs
uniforms which ~~are [compatible] with~~ mission and climate /3/
*

Senior officers present afloat in district waters shall ~~[insofar]~~

much as possible
as ~~[practicable,]~~ follow the uniforms prescribed by the Commandant.

This applies both personnel
~~with [regard]~~ to liberty parties and ~~members of the command~~

~~<operating> <*RUNNING~~.WORKING*> ashore./4/ Uniform
*

~~<selections>~~ <*CHOICES*> are to be at the discretion of the

prescribing authority and not optional to the individual. Local

Figure G-3. Same Printout with Editing Notes

139

Uniform Regulations shall be ~~<promulgated> <*ANNOUNCED.~~ISSUED*> by

each Commandant. Area Commander. SOPA or other

~~<designated> <*APPOINTED.CHOSE/~~CHOSEN*> authority,

~~<utilizing> <*USING*>~~ the format ~~<provided> <*GAVE/~~GIVEN.~~SAID~~*> in

the sample instruction attached ~~(appended)~~ to this chapter shall be used./5/ Uniforms for

*

daily wear are used like ~~<equivalent> <*EQUAL*> to~~ civilian business clothes. ~~(attire)~~

They are used for things like ~~and prescribed for normal executive~~ office work. standing watch ~~(watchstanding.)~~

liberty and official business ashore./6/ Service Dress uniforms

*

are normally prescribed as the uniform of the day.

--------------------------------NOTES--------------------------------

/ 1/ This sentence contains 23 words - consider shortening it.

/ 2/ This sentence contains 26 words - consider shortening it.

/ 3/ This sentence contains 23 words - consider shortening it.

/ 4/ This sentence contains 30 words - consider shortening it.

/ 5/ This sentence contains 28 words - consider shortening it.

/ 6/ This sentence contains 23 words - consider shortening it.

------------------ READABILITY RESULTS ----------------------

Number of Sentences	Number of Words	Number of Syllables
9	204	404

Figure G-3. Same Printout with Editing Notes (continued)

```
Avg. Number of Words per Sentence     Avg. Number of Syllables per Word
              22.66                                   1.98

 GRADE LEVEL    (Based on DOD Readability Standard)
       16.6

------------------     WORDS NOT ON BASIC LIST     ----------------------

WORD                     FREQ            WORD                     FREQ

appended                   1           attire                      1
compatible                 1           coordinators/sen            1
domiciled                  1           geographical                1
insofar                    1           practicable                 1
                                       regard                      1
responsability             1           sub-areas                   1
uniformity                 1           watchstanding               1
```

Figure G-3. Same Printout with Editing Notes (continued)

The Commandant of each Naval District is assigned the responsibility for setting up and controlling uniform policies within his District. He shall prescribe uniforms for the season, day or special occasion for all Naval and Marine personnel which will be most uniform. Personnel of all Naval Activities housed within the District shall wear only those uniforms prescribed for the District. The Commandant may choose [sub-areas.] He may also assign area [coordinators] (or senior officers present) authority to prescribe local uniforms which meet mission and climate needs. Senior officers present afloat in district waters shall, as much as possible, follow the uniforms prescribed by the Commandant. This applies to both liberty parties and personnel working ashore. Uniform choices are to be at the discretion of the prescribing authority and not optional to the individual. Local Uniform Regulations shall be issued by each Commandant, Area Commander, SOPA or other chosen authority. The format given in the sample instruction attached to this chapter shall be used. Uniforms for daily wear are used like civilian business clothes. They are used

Figure G-4. Passage After Changes Suggested by Computer Analysis for things like office work, standing watch, liberty and official business ashore. Service Dress uniforms are normally prescribed as the uniform of the day.

------------------ READABILITY RESULTS ---------------------

Number of Sentences
13

Number of Words
200

Number of Syllables
354

Avg. Number of Words per Sentence
15.38

Avg. Number of Syllables per Word
1.77

GRADE LEVEL (Based on DOD Readability Standard)
11.2

------------------ WORDS NOT ON BASIC LIST ---------------------

WORD	FREQ	WORD	FREQ
coordinators	1	sub-areas	1

Figure G-4. Passage After Changes Suggested by Computer Analysis (continued)

The Commandant of each Naval district is assigned the responsibility for setting up and controlling uniform policies within his district. He shall prescribe uniforms for the season, day, or special occasion for all Naval and Marine personnel which will be most uniform. Personnel of all Naval activities housed within the district shall wear only those uniforms prescribed for the district. The Commandant may choose sub-areas. He may also assign area coordinators (or senior officers present) authority to prescribe local uniforms which meet mission and climate needs. Senior officers presently afloat in district waters shall, as much as possible, follow the uniforms prescribed by the Commandant. This applies to both liberty parties and personnel working ashore.

Uniform choices are to be at the discretion of the prescribing authority and not optional to the individual.

Local uniform regulations shall be issued by each Commandant, area Commander, SOPA, or other chosen authority. The format given in the sample instruction attached to this chapter shall be used.

Uniforms for daily wear are used like civilian business clothes. They are used for things like office work, standing watch, liberty, and official business ashore. Service dress uniforms are normally prescribed as the uniform of the day.

Figure G-5. Final Manuscript of Revised Text After Processing by TAEGs Computer Readability Editing System. (Readability is at the High School Level.)